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## CONTENTS.

☞ An asterisk (*) denotes an illustrated article


EDITORIALS—

Extra Copies of the Journal.....221
A Chapter of Accidents.....221
Obituary—Mr. H. W. Benedict of New Haven.....221
Gas Matters in Indianapolis.....221
Fifth Annual Meeting of the American Gas-Light Association.....223
Official Report of Examinations of Illuminating Gas, made at the Photometrical Room of the Department of Public Works.....224
Boiler Explosion in the Pittsburgh Gas Works.....232
Gas Light Intelligence.....233
Water Supply Items.....233
Prices of Gas Coals.....233



WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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## EXTRA COPIES OF THE JOURNAL.

Those of our readers who desire extra copies of the numbers of the JOURNAL, containing the proceedings of the Cincinnati Meeting, will confer a favor by forwarding their orders, stating number of copies required, at once.—ED.

## A CHAPTER OF ACCIDENTS.

The past two weeks have witnessed several disasters in the gas works of our land.

At Richmond, Va., the recent storms flooded the lower portions of the city, and caused the city to be left in darkness for one or two nights owing to the gas works being under water. At Pittsburgh, Pa., a boiler explosion occurred at midnight, the full particulars of which will be found elsewhere. These works were completed about a year ago, and are probably the most thoroughly built and best equipped works of their size in the country. The cause of the explosion is an enigma. The damage was quite serious; but, owing to the fact that the exhausting apparatus was built in duplicate, the stoppage in manufacture was only for a few hours, and no inconvenience resulted to the consumers.

At Indianapolis another kind of explosion occurred, by which a gasholder was destroyed and a tank somewhat seriously injured. The cause of this explosion is "another conundrum which no fellow can find out." Holders do blow up sometimes in old works, where something breaks down, or an escape occurs; and our columns will bear witness to many such accidents where works under the direction of very skillful management meet with mishaps of a very serious nature. But here is a new works, to be run under a new process, that is to far outshine all antiquated methods of gas making, that signalizes its first operation by an explosion that caused some people to think that the end of all things was at hand, and that water gas was a powerful thing. The safety of the *process* cannot be questioned, although, at New London, Conn., and at Utica, New York, similar "accidents" have occurred with water gas; and, if the whole truth was known, many others, about which nothing has been said, would have been recorded. The result of all this should be to convince people that the gas business is not all profit. That there are many risks and dangers accompanying it that are little known to people in general.

With reference to the persons having charge of the new works at Indianapolis, we learn that one of them has had some experience in gas works before, but the other two had not. From the account, given in another column, taken from the various daily papers of the place, our readers can gather the facts and draw their own conclusions.

## OBITUARY.

### H. W. BENEDICT, OF NEW HAVEN.

The gas companies of Connecticut and Western Massachusetts have met with a serious loss in the sudden death of Mr. H. W. Benedict, of New Haven, which took place on Sunday last. Many of the companies in that section of the country are indebted to him for their original organization, and for the interest he manifested in their subsequent direction. To his excellent judgment and sound discretion may be attributed much of the success that has attended those companies. Those who were familiar with him need scarcely be reminded of the strict integrity which characterized his entire business career; while to his untiring activity may be attributed the success of many of the enterprises in which he was engaged. While at Ocean Grove, New Jersey, last week, he was summoned home, on account of the serious illness of his wife; too late to secure regular communication to New York, and anxious to reach home as soon as possible, he took a passage on the ill-fated construction train which met with disaster on the Jersey Central Railroad, last Sunday, and lost his life in that calamity.

In all the walks of life—as a citizen, a business man, a genial and kind neighbor, and a true Christian—he has left an example worthy of all imitation.

## Gas Matters in Indianapolis.

### CHEAP GAS.

The old gas company, as will be seen by notice published below, have reduced the price of gas to $2 per thousand feet to all consumers in the city. They have also reduced the price to $1 per 1,000 feet on all streets where the new company have laid down mains. This is certainly a very liberal reduction and ought to be satisfactory to consumers. The old company now have about 100 miles of mains, and about one million dollars invested in the manufacture of gas. They are making gas only on the most certain and approved methods, which have been tested in all large cities, and are making a quality of gas much superior to any

that has ever been made by any new-fangled process that has been introduced. There has probably never been a time when the mains laid down by the old company in the suburbs of the city has ever paid anything on the investment; but they were compensated for this by the greater consumption in the solid business part of the city. Now that a new company has been chartered which is placing mains in the densely built up part of the city, with the expectation of taking the cream of the trade, the old company have reduced the price in this densely-settled district to one-half, we believe, the price the new company are proposing to charge. This they do for two reasons: First, they can actually afford to furnish the gas cheaper on Washington and other business streets than they can in the suburbs, because the same-sized mains have ten times the patronage; and, second, because they do not propose to be driven from the streets where they have the largest and best customers. They expect to distribute the larger portion of their profits for the next few years among their consumers.

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Notice to consumers of gas.—The Indianapolis Gas-Light and Coke Company hereby gives notice that, after November first, the price of gas will not exceed $2.00 per 1,000 feet. On all streets where the Citizens' Gas-Light and Coke Company have mains a discount of $1 per 1,000 feet will be allowed from the above price to all persons paying their bills on or before the 10th of each month. Respectfully,

H. Wetzel, Secy.

—*Indianapolis Journal*, Oct. 30, 1877.

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[From Indianapolis *Daily Sentinel*, Nov. 16, 1877.]

TERRIFIC EXPLOSION OF THE CITIZENS GAS WORKS.

About 12:30 yesterday afternoon the city was startled by the sound of an explosion. At first many thought it was an earthquake, as doors and windows were broken in many parts of the city. All sorts of rumors prevailed for a short time, but it was soon ascertained that the new gas works on the canal, near Pratt street, had blown up. In a very short time the scene of the accident was surrounded by a crowd of several hundred people who were attracted to the spot by various rumors which were afloat. It was reported that 25 men had been killed, and that many others had been injured, but in a short time these rumors were proven unfounded, as no one was injured, since all the employees and attaches were at dinner at the time of the explosion.

THE GASOMETER.

The gasometer, or reservoir, which exploded, was 87 feet in diameter and 27 feet deep, and was made of boiler iron. The explosion tore off the iron roof from this tank and threw the fragments of iron in all directions, some of it falling as far as half a mile away. The iron was literally torn and split in fragments, the force being such as to warp and twist it in all manners of shape. Several of the immense standing pillars were also broken. Even the sides of the tank were pulled out and lay a total wreck upon the embankment. The building in which the gas is manufactured is located but a short distance away, but this was only slightly damaged, aside from a general shaking up which it received. The machinery was examined by Messrs. Frost and Flannery, and they estimate the loss to the machinery at several thousand dollars, and it is thought the total loss will aggregate $20,000, though a difference of opinion exists in this respect.

WHY IT EXPLODED.

There are numerous theories as to why the tank exploded, and it is impossible to assign any reason with certainty. The gas which was in the tank was not the regular illuminating gas, but a hydrogen gas which was put in and forced into the mains to see if any leaks existed. By some it was supposed that the gas became ignited, but this idea is scouted by the officers of the company, as the machinery was so little disturbed, and on the spur of the moment they could only suggest the *spontaneous combustion theory*.

NO ONE HURT.

It was quite fortunate that all the workmen were at dinner at the time, and no one was hurt. Had there been a crowd about the place lives certainly would have been lost. Mr. M. S. Frost, president of the company, could give no reason why the explosion occurred, but he said that the process of making gas had nothing to do with it, and in this he was borne out by J. R. Pearson, superintendent, and R. B. Harrison, assistant superintendent. At the time of the explosion there were but 26,000 cubic feet of gas in the tank, and it has a capacity of 115,000 cubic feet. The explosion was undoubtedly due to some combination of chemicals.

RESUMING WORK.

The work of repairing the damage will be commenced immediately, and it is thought that all can be accomplished inside of two weeks, though originally it required six weeks to build it. Workmen have been sent for, and they will arrive here from Pittsburgh in a few days to do the work. It is feared that the brick work of the cistern of the tank was strained, but it is hoped not. Everything about the works was in the most complete order, and they expected to begin supplying gas to consumers on Monday.

THE EFFECT.

The force of the explosion was such that windows and doors were broken for squares around, and the concussion was felt as far as three miles from the place. The twenty inch main on Pratt street was blown up for some distance, and the street looked as if an earthquake had visited the immediate vicinity.

THE TRUE CAUSE.

Late last evening a *Sentinel* reporter had another conversation with Mr. Frost, and he said the only cause for the explosion which he could assign was that a match or lighted cigar might have been dropped at the opening of the mains on the corner of Illinois and First streets. The hydrogen gas, when combined with atmosphere, would explode, when the slightest spark of fire was brought in contact with it. The fire could not have come from the works, as the valves were shut off on Wednesday evening, and were not opened at all yesterday, and the machinery was left intact. There was no insurance against such an accident.

A sheet of iron weighing fully 1,800 pounds was thrown about 75 feet by the force of the explosion.

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[From Indianapolis *News*, Nov. 15, 1877.]

THE PRESIDENT'S OPINION.

Mr. M. S. Frost, president of the company, could not quite account for the cause of the explosion, though he said there were several ways in which it might occur, as accidents of this kind were by no means rare. The process of the manufacture of the gas has nothing whatever to do with the explosion, as a similar accident might happen by any other process. He explained that the tank was not filled with their regular illuminating gas, but a hydrogen gas which was being used to test the mains. He thought it might be caused by a certain admixture of air in the tank, forming in specific chemical combinations, an explosive compound or it might have been occasioned by a smart blow on the outside of the tank. Mr. Frost, however, laid no special emphasis on either of the advanced theories, seeming to have very little faith in them himself. He said that the damage would be in the neighborhood of $20,000, on which there is no insurance, but that work will be commenced immediately for the rebuilding of the gasholder. In answer to the question how long it would take to repair the damage, Mr. Frost said he could not exactly answer. It might be the brickwork of the cistern of the tank was strained by the concussion and would need resetting. This, with the boiler iron work of the gasometer, and the replacing of the broken cast-iron pillars surrounding and supporting it would all take time.

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[From Indianapolis *Journal*, Nov. 18, 1877.]

Dr. Henry Jameson has written the following letter, giving his theory of the explosion:

To the Editor of the *Journal*—

Having been called upon by several parties to express an opinion as to the cause of the explosion of the reservoir of the Citizens Gaslight and Coke Company, with your indulgence, I take the liberty of doing so publicly.

I could have no opinion as to the point of ignition, for I have had scarcely any opportunity for investigation. By exclusion, however, it may be narrowed down to such limits that the location of the point of ignition may be discovered. We exclude altogether all spontaneous combustion theories as being absurd, because the explosive agent was simply a mixture of hydrogen and air, (the oxygen thereof being the active agent,) two substances which unite under no circumstances except where the temperature is highly elevated, no amount of concussion or jarring would bring about a union. The small portion of carbonic oxide which would have passed from the generators, had they been in operation and had it not been passed through coolers before it came in contact with the air in the reservoir, might possibly have served to ignite the mass, but the generators were not in operation at the time of the explosion, and furthermore, it is conclusively demonstrated that the fire did not originate here, as no explosion took place in the machinery back of the valve in the supply-pipe, which was shut at the time. This leaves but one conclusion: That the mixture came in contact with some ignited substance at a point outside of the works, either at some of the vents, meter connections, or possibly a leak in the mains, and that it was communicated to the reservoir. Respectfully,

Henry Jameson.

MISCELLANEOUS.

It is reported that an old lady, ill for several weeks, died shortly after the explosion, and the explosion is supposed to have hastened her demise. Her name was not ascertained.

Mrs. Brown, corner of Fort Wayne avenue and Alabama street, was in the street at the time of the occurrence, and upon glancing upward saw a dark object hurtling through the air. She retreated to the house, and the object falling close at hand was found to be a good-sized piece of metal from the works.

The residents of St. Mary street were considerably shaken up by the explosion, and without exception, at first glance, they thought that mother earth was having an earthquake tantrum. The shock rang door bells, opened doors, jarred pictures hanging on the walls until they swung to and fro, and rattled the timbers of the best constructed houses.

A funny incident was witnessing a colored man originally very dark, who came bounding out of Sam. Watson's stable the very picture of fright, his ebony-hued complexion changed to a creamy white, and it was hard to satisfy him that the judgment day was not at hand. So, too, the two old colored ladies near the Yellow bridge, who swung upon each other's neck, and shouted: "He's comin'; let's clasp and go together."

## Fifth Annual Meeting of the American Gas-Light Association.

HELD IN CINCINNATI, OHIO, OCT. 17, 1877.

OFFICIAL REPORT.

[Continued from page 188.]

### EVENING SESSION.

DISCUSSION ON THE SUBJECT OF NAPHTHALINE—CONTINUED.

Captain Dresser—I would ask if there was any change in the temperature about the time you took that thing out—or any other reasons which might have accounted for the results?

Captain White—Yes, sir; while the weather is regularly cold, or regularly warm, there is generally no trouble; but changes in the weather give trouble. But while we had this box I speak of we never had any trouble whatever—no difference what the changes were. There were changes about the time I took it out, and I don't suppose if the weather had been regular there would have been as much annoyance.

Mr. Forstall—You feel satisfied that if the box had remained in there would have been no trouble?

Captain White—Yes, sir; perfectly.

Chas. H. Nettleton—I rise to corroborate what Messrs. White and Curley have said. About six months ago my attention was directed to an article, by Mr. Young, which I thought over very carefully, for a week or so, when Mr. Curley's pamphlet came around corroborating what Mr. Young had said; and I immediately commenced the process, putting steam through the coal, making the tar run from the box and go out of the bottom, which kept it full of tar. That was in February. I cut down my cannel one-half. The first day or two the gas was a little poor, but it picked up; and, through she summer, we only used one-half as much cannel and had equally good gas. My works are very small, and I had been doing very poorly. I gradually increased the yield until it reached 5 feet, but that was too much. I now run 4·80 and 4·90, and my gas will run from 17 to 18 candles. Before that I would see considerable quantities of naphthaline in the purifier-house; but since that I haven't seen a particle, not a single drop in any of my pipes. In regard to what Mr. McElroy said about heating the tar; while on my journey here I talked with Mr. Young, and he said "be careful not to heat the tar too much." If you run the temperature too high it will drive off the heavier tar and that will condense the naphthaline. I found that Mr. Young has a way of accomplishing the same result, even more simple than mine; and, as he is here, perhaps he will give it to the Association.

Mr. Young—My experience is pretty much the same as Mr. White's and Mr. Curley's. Recently we have commenced utilizing the ammoniacal liquors. I put up a little pump and pumped the ammoniacal liquor back into the mains, and I noticed a little improvement in the gas from the ammoniacal liquor. One day I had omitted to pump the tar out of the well, and it rose up into the suction pipe of the pump which was used for the ammoniacal liquor. I noticed considerable improvement in the illuminating power of the gas. Previous to that we had used the residuum, as we called it, about three or four parts, mixing it up with saw-dust. I went out to the foreman, and asked if he was using more tar than usual, and he said no. I asked if he noticed any improvement in the gas, and he said he belived it was better. Upon investigating I found that the pump was pumping back tar through the hydraulic main; and from that day to this we abondoned the use of oil altogether to keep up the illuminating power, and we now get from 16½ to 17 candles, according to the heat; but, of course, if we run our yield up to five feet, we diminish the illuminating power. Since I adopted this practice I haven't seen a trace of naphthaline, and I have no trouble to keep my gas up, in that way, to 17 candles. I consider the use of tar equal to two and a-half or three candles. Using nut coal and slack, I get 4·60; lump coal, 4·80 and 4·85.

The President—It will be necessary now for us to pass on to some other subject; so there will be another paper read. Unless some gentleman is very anxious to continue this discussion, I will call upon Mr. Somerville to read his paper.

Mr. Jas. Somerville, of Knoxville, Tenn., then read the following paper on—

THE DEFECTS OF THE GAS GLOBE AND HOLDER.

I have long held the opinion, and I am sure you will all agree with me, that any improvement we can suggest, or effect, that will have a tendency to make the gas we manufacture and sell more economical, agreeable, and beneficial to the consumer, just to that extent will it be the more agreeable and beneficial to us, and the companies we represent here.

Therefore, holding these views as we do, it has been thought that the subject of the defects of the ordinary gas globe and holder merited from us some consideration, with a view to their improvement.

A gas globe, I take it, ought to combine utility with ornament. As they are at present constructed the utility is entirely left out, with the exception of some kinds of opal globes, which have some points of utility, but none of ornament. It is a source of constant annoyance to the gas engineer to see the sixteen candle gas which he has sent to the consumer dwindle down to eight or nine candles, by the use of the common globe and holder.

His sensations, when observing this, are similar to those of an artist when in the exhibition rooms he sees his best painting hung in a miserable light, or, rather, the merits of the painting obscured by the frame. But the painter is wiser than we are, for his greatest anxiety, after completing the picture, is that it shall be seen and admired to the best advantage.

And so it is with every other profession and trade; the greatest care and skill is exercised by the manufacturer and merchant, so that the articles they produce and sell shall be seen by the purchaser in the most favorable light.

Take, for instance, the kerosene lamp-maker; observe the ingenuity and the art he has displayed in bringing his lamps to such perfection, that every particle of light the oil will give is consumed to the best advantage, and the burners and shades are so admirably arranged that the rays of light are directed to the very point where they are most required. Can we say the same as to gas-lighting? Is it not a fact that in the room where gas is used the ceiling is often, I may say invariably, the only place well lighted. Can it be said that the maker of gas lamps has displayed skill and ingenuity in so arranging his globes and shades that the gas is burned to the best advantage? We are forced to admit that the reverse is true. Hence it is that the kerosene oil lamp is a dangerous competitor with gas. Who of you have not witnessed, time and again, the gas flame inside the globe flickering, wavering, and dancing, as the cold air rushes through the narrow orifice, impinging against the light, causing it to smoke at the points, and destroying half its value, while the agitated flame allows a portion of the gas to escape unburnt, which produces that perceptible odor of gas in most of our churches, and halls.

I have a faint hope that perhaps the expression or action, of the Association upon this subject may induce the manufacturers of globes and holders to make them more adapted to the purpose for which they are intended—viz., to impart steadiness to the flame, and direct and allow the rays of light to reach that point where they are most required, and, at the same time, to be ornamental. I say a faint hope. For a number of years I have been looking for, and expecting, a globe of this description, but in vain; they change not. It would appear that they were beyond improvement, that they were unalterable—for it is a fact that the ordinary globe remains the same to-day as when first invented.

Improvement is the order of the day. Every industry is awake to, and applying, it; but gas globes remain the same rarefied air producers, the same flame agitating machines, they ever were. And this is all the more surprising when we consider that the improvement, or remedy needed, is so simple, so effectual, and so costless, that we wonder it has not been effected long ago.

The first and greatest defect of the ordinary globe is its two inch opening at the bottom; this diameter is just two inches too small. What reason is assigned for this narrow opening? Why it was fixed at that size, and why it remains so, I am totally unable to conjecture. But it is this defect that produces most of the trouble which I have described; and as if this opening was not already too small, the maker of globe holders, who, it appears, is in hearty sympathy with the globe manufacturer, contrives still more to contract this opening and obscure the light by furnishing the globe with what is, I suppose, meant to be an *ornamental* holder.

You are all familiar with it—observe these three little holes for the air to get in—observe also what precaution is taken so that none of the light shall get out—look how the metal is spread out at right angles to the light—observe with what reluctance the maker has left even the three little air holes!

The globe holder ought to be constructed only of three prongs of brass wire, not over one-eighth of an inch thick, and any additional strength required ought to be put parallel with the downward rays of light, so that it will cast no shadow.

No rim whatever is required to the holder; the prongs ought to be so fashioned at the ends as to receive the rim of and support the globe.

The globe ought to be made with its bottom opening never loss than four inches in diameter, and from seven to eight inches diameter at its widest part. These dimensions will allow the air ample passage through the globe, without striking against the flame, and will actually have a tendency to steady the light, which is the great *desideratum*. It will also allow the best form of burner to be used, and the rays of light will have ample scope to strike downward to the place where they are most required; and, in short, the consumer will get the full benefit of the light. All globes ought to have a space of three inches of clear glass round the bottom, and in ornamenting and flowering, the maker ought to have this one end always in view, to intercept the rays of light as little as possible.

Opal and ground glass globes ought to be entirely discarded when it is known that they obscure from forty to fifty per cent. of the light. If the light requires to be toned, surely the most effective method is to *turn* it down; this method has also the advantage of being the cheapest. These opal and ground globes can await the event

of the electric candle, which some people prophesy is not far distant. From what I can hear of the light the candle gives they will be required then. In conclusion, gentlemen, if globes and holders are made and used as I have attempted to describe, we will have far less complaints of bad gas and poor lights, and I need not point out to you that the duty of attending to the wants of the consumers, is becoming more and more our duty. We are the parties interested. Let us not always turn him over to the tender mercies of the gas-fitter.

I am of the opinion the *gas* companies are the proper persons to do the *gas* fitting.

My experience is that it pays well in every way for the gas engineer to see that the consumer gets the full benefit of the light he is purchasing from us, as far as we are able to do, with the articles at our command.

I hope the wisdom of the Association may suggest some method of drawing the attention of the makers of globes and holders to the importance of this greatly desired improvement. It is to their own interest to effect it, for the use of the globe would thereby be extended. Since preparing this paper I observe the same subject, the defects of the globe and holder, is being ventilated in England. Let this country have the honor of being the first to adopt the improvement suggested.

When Mr. Somerville's paper was concluded, discussion of the same was called for by the President, and Mr. McIlhenny said—

I think, Mr. President, that we can all verify what Mr. Somerville says. I think he has presented the subject in a very able and comprehensive manner; and, certainly, we all should be interested in that subject. Every word he said is true, and I think if something can be done to cause investigation, it will be of great advantage to both the consumer and seller of gas; so that I hope the subject won't rest here, but having been opened it will go on growing until something is done.

A member—I think that article should be published in the newspapers of all the cities, so as to bring it before the people, and then they won't say that the gas companies are alone to blame in this matter.

Mr. Starr—I would suggest that the paper should be sent to the makers. This could be done by forwarding the GAS-LIGHT JOURNAL to them.

Capt. Dresser—We would be very glad to do so.

Mr. McIlhenny—I have little faith in the people adopting anything of that kind. About nine years ago I made a pretty comprehensive statement to the people, in a series of experiments I made with globes and burners, and I did'nt see any results in the community. The only way it can be accomplished is through the globe manufacturers. If you simply want the public to adopt them without their help you can't accomplish your object.

Captain Dresser—I will make a statement on this subject. I presented this matter to one of the leading gas companies of New York, and asked them why they didn't endeavor to get the globe and fixture makers to furnish such a globe as would burn gas to the best advantage. They said they had tried it; had applied to the leading manufacturers in New York, and their reply was that it wasn't the fashion, and the ladies wouldn't have them.

Now, you have to manage some things in one way and with others you can do better to manage in another. Some of the members of the Association have great influence with the ladies, and they must take the lead in this matter of shades. They must make the ladies believe that it is the fashion to have a wide, open-bottomed shade, and then there will be some hope for the gas maker selling his gas, and the consumer getting value received for the money paid for it. [Applause and Laughter.]

Captain White—After the extended remarks of the worthy Editor of the JOURNAL, I may be allowed to give my experience among the ladies. I had a laughable experience. I was in the service of a company,

[Continued on third column, next page.]

**Official Report of Examinations of Illuminating Gas, for the week ending November 3, 1877, made at the Photometrical Room of the Department of Public Works.**

| Date. | Time. | Temperature of Thermometer. | Barometer. | Gas Company | Burner. | Pressure at Point of Ignition. | Consumption of Gas. Rate per hour. | Consumption of Candle, Grs. per hour | Illuminating Power. Observed. | Illuminating Power. Corrected. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1877. | | Deg. | | | | In. | | | | |
| Oct. 29 | 10.30 A.M. | 63 | 30.110 | New York..... | Sugg-Letheby..... | .05 | 4.99 | 120 | 16.16 | 16.19 |
| " 30 | 10.30 A.M | 63.5 | 30.082 | " ..... | " ..... | .05 | 5.03 | 121.2 | 16.12 | 16.18 |
| " 31 | 10 A.M. | 64 | 29.956 | " ..... | " ..... | .05 | 5.00 | 123 | 15.80 | 16.19 |
| Nov. 1 | 9.30 A.M. | 60.5 | 30.082 | " ..... | " ..... | .05 | 5.00 | 123 | 16.61 | 17.02 |
| " 2 | 10.30 A.M. | 62.5 | 29.720 | " ..... | " ..... | .05 | 5.00 | 121.2 | 16.24 | 16.40 |
| " 3 | 11.30 A.M. | 60.5 | 29.917 | " ..... | " ..... | .05 | 5.00 | 123 | 16.20 | 16.60 |
| | | | | | | | | | Av'ge. | 16.43 |
| Oct. 29 | 10 A. M. | 63 | 30.110 | Manhattan..... | " ..... | .05 | 4.97 | 120 | 17.32 | 17.42 |
| " 30 | 11 A M. | 64 | 30.082 | " ..... | " ..... | .05 | 4.96 | 124.2 | 16.24 | 16.93 |
| " 31 | 9.30 A.M. | 63.5 | 29.956 | " ..... | " ..... | .05 | 4.91 | 121.2 | 16.96 | 17.43 |
| Nov. 1 | 10 A.M. | 61 | 30.082 | " ..... | " ..... | .05 | 4.95 | 122.4 | 17.09 | 17.60 |
| " 2 | 10 A. M. | 62 | 29.720 | " ..... | " ..... | .05 | 5.06 | 120 | 16.76 | 16.56 |
| " 3 | 12 M. | 61 | 29.917 | " ..... | " ..... | .05 | 5.00 | 123.6 | 16.57 | 17.06 |
| | | | | | | | | | Av'ge. | 17.17 |
| Oct. 29 | 9.30 A.M. | 62 | 30.110 | N. Y. Mutual..... | " ..... | .05 | 4.44 | 123.6 | 16.29 | 18.88 |
| " 30 | 11.30 A.M. | 64 | 30.082 | " ..... | " ..... | .05 | 4.12 | 121.2 | 15.56 | 19.06 |
| " 31 | 9 A. M. | 63 | 29.756 | " ..... | " ..... | .05 | 4.12 | 123 | 15.60 | 19.30 |
| Nov. 1 | 10.30 A.M. | 61 | 29.082 | " ..... | " ..... | .05 | 4.38 | 121.2 | 16.68 | 19.23 |
| " 2 | 9 A. M. | 61 | 29.720 | " ..... | " ..... | .05 | 4.20 | 123 | 15.82 | 19.30 |
| " 3 | 12.30 P.M. | 61.5 | 29.917 | " ..... | " ..... | .05 | 4.28 | 123 | 15.37 | 18.40 |
| | | | | | | | | | Av'ge. | 19.03 |

**For the Week Ending November 10, 1877,**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Nov. 5 | 10 A. M. | 58.5 | 30.200 | New York..... | Sugg-Letheby..... | .05 | 4.96 | 121.5 | 15.84 | 16.15 |
| " 7 | 1.30 P.M. | 58 | 30.523 | " ..... | " ..... | .05 | 5.07 | 123 | 16.76 | 16.94 |
| " 8 | 10 A. M. | 67 | 30.354 | " ..... | " ..... | .05 | 5.00 | 124.2 | 15.24 | 15.77 |
| " 9 | 12 M. | 67 | 29.724 | " ..... | " ..... | .05 | 5.02 | 121.8 | 16.45 | 16.86 |
| " 10 | 12.30 P.M. | 60.5 | 30.232 | " ..... | " ..... | .05 | 4.96 | 123.6 | 16.11 | 16.72 |
| | | | | | | | | | Av'ge. | 16.48 |
| " 5 | 9.30 A.M. | 58 | 30.200 | Manhattan..... | " ..... | .05 | 5.04 | 121.2 | 17.12 | 17.15 |
| " 7 | 1 P. M. | 57.5 | 30.523 | " ..... | " ..... | .05 | 5.00 | 121.5 | 16.43 | 16.62 |
| " 8 | 11 A. M. | 68 | 30.354 | " ..... | " ..... | .05 | 5.00 | 118.2 | 16.44 | 16.19 |
| " 9 | 11.30 A.M. | 67 | 29.724 | " ..... | " ..... | .05 | 4.96 | 124.8 | 16.56 | 17.35 |
| " 10 | 1 P.M. | 60.5 | 30.232 | " ..... | " ..... | .05 | 5.01 | 121.5 | 16.96 | 17.35 |
| | | | | | | | | | Av'ge. | 16.88 |
| " 5 | 9 A. M. | 57.5 | 30.200 | N. Y, Mutual..... | " ..... | .05 | 4.30 | 124.2 | 15.60 | 18.76 |
| " 7 | 12.30 P.M. | 57.5 | 30.523 | " ..... | " ..... | .05 | 4.57 | 123.6 | 17.08 | 18.87 |
| " 8 | 11.30 A.M. | 69 | 30.354 | " ..... | " ..... | .05 | 4.05 | 118.2 | 14.50 | 17.63 |
| " 9 | 11 A. M. | 66.5 | 29.724 | " ..... | " ..... | .05 | 4.06 | 117.3 | 14.97 | 18.05 |
| " 10 | 1.30 P.M. | 61 | 30.222 | " ..... | " ..... | .05 | 4.07 | 120.0 | 15.68 | 19.16 |
| | | | | | | | | | Av'ge. | 18.49 |

G. LOVE, Gas Examiner

**Official Report of Examinations of Illuminating Gas, for the week ending November 17, 1877, made at the Photometrical Room of the Department of Public Works.**

| Date. | Time. | Temperature of Thermometer. | Barometer. | Gas Company. | Burner. | Pressure at Point of Ignition | Consumption of Gas Rate per hour. | Consumption of Candle, Grs. per hour. | Illuminating Power. Observed. | Illuminating Power. Corrected. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1877. | | Deg. | | | | In. | | | | |
| Nov. 12 | 12 M. | 59.5 | 30.181 | New York..... | Sugg-Letheby..... | .05 | 5.04 | 118.2 | 16.68 | 16.29 |
| " 13 | 11 A.M. | 68 | 30.889 | " ..... | " ..... | .05 | 5.01 | 123.6 | 15.94 | 16.37 |
| " 14 | 11.30 A.M. | 69 | 30.476 | " ..... | " ..... | .05 | 5.03 | 123.6 | 16.09 | 16.47 |
| " 15 | 11 A.M. | 66.5 | 30.318 | " ..... | " ..... | .05 | 5.04 | 124.2 | 15.84 | 16.25 |
| " 16 | 10.30 A.M. | 66.5 | 30.153 | " ..... | " ..... | .05 | 4.93 | 123. | 15.48 | 16.08 |
| " 17 | 11 A. M. | 67 | 30.181 | " ..... | " ..... | .05 | 4.98 | 122.4 | 16.16 | 16.54 |
| | | | | | | | | | Av'ge. | 16.33 |
| " 12 | 11.30 A.M. | 59 | 30.181 | Manhattan..... | " ..... | .05 | 4.94 | 123. | 16.16 | 16.75 |
| " 13 | 10.30 A.M. | 67 | 30.389 | " ..... | " ..... | .05 | 5.00 | 123. | 16.79 | 17.21 |
| " 14 | 12.30 P.M. | 69 | 30.476 | " ..... | " ..... | .05 | 5.06 | 117. | 17.28 | 16.64 |
| " 15 | 10.30 A.M. | 66 | 30.318 | " ..... | " ..... | .05 | 5.05 | 123.0 | 16.50 | 16.74 |
| " 16 | 11 A.M. | 66.5 | 30.153 | " ..... | " ..... | .05 | 5.00 | 123.6 | 16.68 | 17.18 |
| " 17 | 10.30 A.M. | 67 | 30.181 | " ..... | " ..... | .05 | 5.01 | 123.6 | 16.78 | 17.23 |
| | | | | | | | | | Av'ge. | 16.96 |
| " 12 | 11 A. M. | 58.5 | 30.181 | N. Y. Mutual..... | " ..... | .05 | 4.29 | 117. | 16.84 | 19.13 |
| " 13 | 10 A M. | 66 | 30.389 | " ..... | " ..... | .05 | 4.25 | 118.2 | 16.47 | 19.07 |
| " 14 | 1 P.M. | 69 | 30.476 | " ..... | " ..... | .05 | 4.93 | 117.6 | 15.70 | 19.56 |
| " 15 | 10 A. M. | 66 | 30.318 | " ..... | " ..... | .05 | 3.24 | 117. | 16.32 | 18.75 |
| " 16 | 11.30 A.M. | 67 | 30.153 | " ..... | " ..... | .05 | 4.25 | 120. | 16.16 | 19.00 |
| " 17 | 10 A.M | 66.5 | 30.181 | " ..... | " ..... | .05 | 4.19 | 123. | 15.32 | 18.73 |
| | | | | | | | | | Av'ge. | 19.04 |

**For the Week ending November 24. 1877.**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Nov. 19 | 10 A.M. | 58 | 30.342 | New York..... | Sugg-Letheby..... | .05 | 4.92 | 121.2 | 15.76 | 16.17 |
| " 20 | 10.30 A.M. | 61.5 | 30.566 | " ..... | " ..... | .05 | 5.02 | 126. | 15.76 | 16.45 |
| " 21 | 11 A.M. | 60 | 30.625 | " ..... | " ..... | .05 | 5.03 | 126. | 15.88 | 16.57 |
| " 22 | 10.30 A.M. | 60 | 30.460 | " ..... | " ..... | .05 | 5.02 | 124.8 | 15.85 | 16.42 |
| " 23 | 10 A.M. | 64.5 | 30.429 | " ..... | " ..... | .05 | 5.02 | 126. | 15.36 | 16.05 |
| " 24 | 3.30 P.M. | 66.5 | 30.316 | " ..... | " ..... | .05 | 4.95 | 126. | 15.44 | 16.39 |
| | | | | | | | | | Av'ge. | 16.34 |
| " 19 | 10.30 A.M. | 58 | 30.342 | Manhattan..... | " ..... | .05 | 5.03 | 123.6 | 16.45 | 16.82 |
| " 20 | 10 A. M | 61 | 30.566 | " ..... | " ..... | .05 | 5.02 | 122.4 | 17.44 | 17.72 |
| " 21 | 11.30 A.M. | 60 | 30.625 | " ..... | " ..... | .05 | 5.05 | 126. | 17.12 | 17.78 |
| " 22 | 10 A.M. | 59.5 | 30.460 | " ..... | " ..... | .05 | 5.06 | 126. | 17.48 | 18.12 |
| " 23 | 11 A.M. | 65 | 30.429 | " ..... | " ..... | .05 | 5.00 | 120. | 17.80 | 17.80 |
| " 24 | 3 P.M. | 66 | 30.316 | " ..... | " ..... | .05 | 5.00 | 120. | 17.08 | 17.08 |
| | | | | | | | | | Av'ge. | 17.55 |
| " 19 | 11 A.M. | 58 | 30.342 | N. Y. Mutual..... | " ..... | .05 | 4.39 | 123.6 | 16.56 | 19.42 |
| " 20 | 9.30 A M. | 61 | 30.566 | " ..... | " ..... | .05 | 4.26 | 123. | 16.21 | 19.50 |
| " 21 | 12 M. | 60 | 30.625 | " ..... | " ..... | .05 | 4.34 | 124.2 | 15.92 | 18.97 |
| " 22 | 9.30 A.M. | 59 | 30.460 | " ..... | " ..... | .05 | 4.36 | 126. | 16.48 | 19.84 |
| " 23 | 11.30 A.M. | 65 | 30.429 | " ..... | " ..... | .05 | 3 84 | 126. | 15.08 | 20.61 |
| " 24 | 2.30 P.M | 66 | 30.316 | " ..... | " ..... | .05 | 4.20 | 124.8 | 15.19 | 18.80 |
| | | | | | | | | | Av'ge. | 19.52 |

F. G. LOVE, Gas Examiner.

some years ago, that, among other things, wanted the storekeepers to understand that a good 8 ft. burner in a window was better than two five feet burners; so I went to work and made experiments, and found what the loss of light was with the different globes and burners. One burner would utilize but forty per cent., and a shade destroyed thirty per cent. of the light. So that the light was very poor even with good gas; I couldn't do anything with the storekeepers, so I tried the ladies. When I got to talking with them they wouldn't talk about anything but the gas and the bills, and how some friend had gone out into the country and his bill was just the same when he returned; but, after they got through, I would quietly take off one shade, and light the jet, shutting off all the rest, and they would be perfectly astonished, and they would exclaim "Why; I never saw so much light in my life in this room. Why, there is no doubt about that—my dress shows so well; but, then, the chandelier looks so bare. I would rather have a ground glass globe even if the bill is a little heavier."

Now we are introducing, in Brooklyn and New York, the use of a wide bottomed shade, with just the three straight brass wires for a support, that Mr. Somerville has referred to. I first used it in my house, and the people would come in from next door and wonder how in the world we ever managed to get such a light; and the popular opinion around there was that I ran a separate pipe from the gas works up to my house, but it was simply owing to the fact that I had put these new shades on. Those shades and burners gradually got through the neighborhood where I was known, and they had good success; but it was bad success for the gas companies, for they didn't sell so much gas. There is no doubt today but that the companies must come to the point where they control the gas to the very point of burning, and dictate the size of the burners, and every thing else.

In Paris the people go to the company and ask for instructions, and they say what shade shall be used and they are used (and there is no city in the world so well lighted as Paris), and when our companies get a like control, they will have the same effect. There is no use making 17 candle gas for a man who has a lot of old brass burners, with one-third enough air supplied to them; and I find, among gas consumers generally, that they don't care for the size of the bill if they can only get a good light.

Now, is it fair that a man should be compelled to burn four or five lights in his parlor when we know that two burners would give him all the light he wants?

Mr. Starr—I have had some little experience in the same way. We have been annoyed in our place with burner patents, and the result was we had a great deal of dissatisfaction, and I finally adopted the plan of furnishing all consumers with the best burner I could get, and now when a man has a house built he comes to the office and gets the burner. I use a double chamber burner, and I think in the last year I have put on fifty gross of them with nine hundred consumers. The people come to us to get burners and it has had this effect—that while other gas companies have been falling off we have always increased, but it has had another effect and that is—it has reduced the bills very materially, which is one reason why I use it.

Mr. Gray—What size is that burner?

Mr. Starr—I have different sizes. I recommend for the kitchen a three foot burner, for the sitting-room a four foot, for the front hall a two foot, and for chambers also a two foot burner, as giving better results than any other. We have 0·3 at night and ·2 in the day time.

Mr. Coggshall—I adopted the same plan of furnishing burners. A few years ago I got up a pamphlet showing the difference in burners, and at the same time offered to furnish burners for just cost, and at present I furnish burners for all the people in our place.

Mr. Stedman—I would like to ask if the use of the large bottomed globe is becoming fashionable?

The President—It is coming into very general use; but now, gentlemen, if you are ready for the next paper I will call upon the author to read it.

Mr. L. P. Gerould then said that as he was suffering from a severe cold, he would ask Capt. Dresser to read his paper for him. The paper was read, as follows:

## On Leakage from Street Mains and Control of the Same by Street Main Valves.

By L. P. Gerould, Engineer of Newton and Watertown Gas-Light Co., Newton, Mass.

I desire to call the attention of the members of the Association to a very important part of gas works which I think has not heretofore received the attention it deserves; indeed, I am sure that in many places it has been altogether neglected. I refer to street main valves.

In the early history of the construction of gas works we have reason to believe that the value of these auxiliaries to street mains was appreciated, and that the use of them was only abandoned when it was found that those which had been introduced could not be relied upon to close when occasion required, owing to the rust which had accumulated about the working parts exposed to air and moisture, rendering them useless. In evidence of this we have the clumsy substitutes which in some instances were resorted to, of drip boxes or water valves with partitions extending nearly to the bottom, forming a part of the main, which could be sealed by partially filling them with water, and thus cut off the flow of gas and which could be restored by pumping the water out again. The habit, however, was formed of dispensing with valves in the extensions of mains, and in the construction of new works. Even in modern times they have formed no part of the plan of distribution, notwithstanding that modern improvements have entirely done away with the objection to their use, and that their present mode of construction renders them entirely reliable when they are needed to cut off the supply of gas from a street or district. A large part of the whole of the gas works in this country have been built by contract, many of them by persons or companies of limited means, and in most cases, it is presumable, with a desire to make the cost as small as possible, and hence, perhaps, it is, that in so few places, the engineer has any control over his gas after it is admitted to the mains for distribution.

No water works are constructed without gates to control the flow of water, enabling the engineer to cut off the supply from a district in cases of breakage of pipes, or need of repair. The same should be the case with gas works, and for the same reason, perhaps even with more force, namely to avoid waste and damage to property, and loss even of life.

Cases have come within my observation, and I presume within the observation of many who hear me, of very considerable leakage in mains from defective joints, and from breakage; in some instances of a percentage of gas so large as to materially diminish the profits of the company; cases when there has been great difficulty in determining the position of breaks or leaking joints from local causes; such, for example, as proximity to, or crossing a common sewer or drain, a loose gravelly soil, in which the pipes are laid underlying a compact stratum of clayey soil—a pavement more or less close, or a layer of frozen ground: or where from such or other causes a horizontal passage is afforded for the escaping gas, by which it escapes detection altogether, or is carried to a distance from the place from whence it makes the escape from the pipe, rendering it impossible to determine, without great expenditure of time and labor in digging down and laying bare the pipe, where the defects are to be found, in order to remedy them. Many instances of this kind might be cited, some of them involving long continued and serious loss; but probably every gas engineer will recall some one or more such cases as having come within his notice, and I need not therefore dwell longer upon the subject.

The introduction of a proper system of street mains valves affords for these evils the only remedy. With them the engineer is enabled to determine what parts of his mains are defective, and the exact loss sustained by such defects, and to remedy them, and until time is afforded for remedying the defects, he may, by closing certain valves, shut off the particular district in which the leakage is occurring during the day time, or all of the hours when the gas is not needed, and thereby avoid a considerable part of the loss which otherwise would be sustained.

It is, however, when large fires take place in cities that sudden and great losses are sustained, from want of suitable means to cut off the gas from the burning districts that the importance of street main valves is most evident. At such times the loss of gas to the company is often very great, even greater in amount than would have been the cost of all the valves necessary on all the mains, yet small in comparison with the loss of buildings and other property, occasioned by its combustion from ruptured distributing pipes in the apartments of the buildings, which afford a continuous combustable for a flame which is not extinguishable by water. But the loss by fires thus occasioned is not the only danger to be apprehended from gas escaping from ruptured pipes in such cases, for there is always liability of its escaping in confined cellars, and other apartments, where it has not the means of becoming immediately ignited, but mixing with the air in proportions to render it explosive becomes an element of still greater destruction.

Instance might be cited where millions of feet of gas have been lost in a single fire, where for nights a whole city has been shrouded in darkness, and where entire buildings have been destroyed by explosions from admixture of air with escaping gas, which otherwise would have escaped the flames of the burning district, occasioning instantaneous loss of property, and what is far more serious, loss of life. With the means at hand for preventing such lamentable occurrence—of avoiding such dangerous risks—it is not a matter of question whether any Gas-light Company is justified in neglecting to take precautionary measures for avoiding such calamities, by placing valves in their street mains, in such positions as will enable them at any time when occasion requires, to shut off the gas from any street or district in which a fire occurs.

In the report of the commissioners appointed to investigate the cause of the great fire in Boston in 1872, it is said: "The fire, like all great city conflagrations, was greatly aggravated by the escape of gas from the burning buildings. The fall of heavy warehouses broke the main pipes, and on Monday morning the escaped gas in the services exploded and caused another fire, which destroyed a million of property and cost two lives. The officers of the gas company believed that their water valves were sufficiently powerful to cut off the supply of gas, as they had proved to be hitherto, but found that the belief was an error.

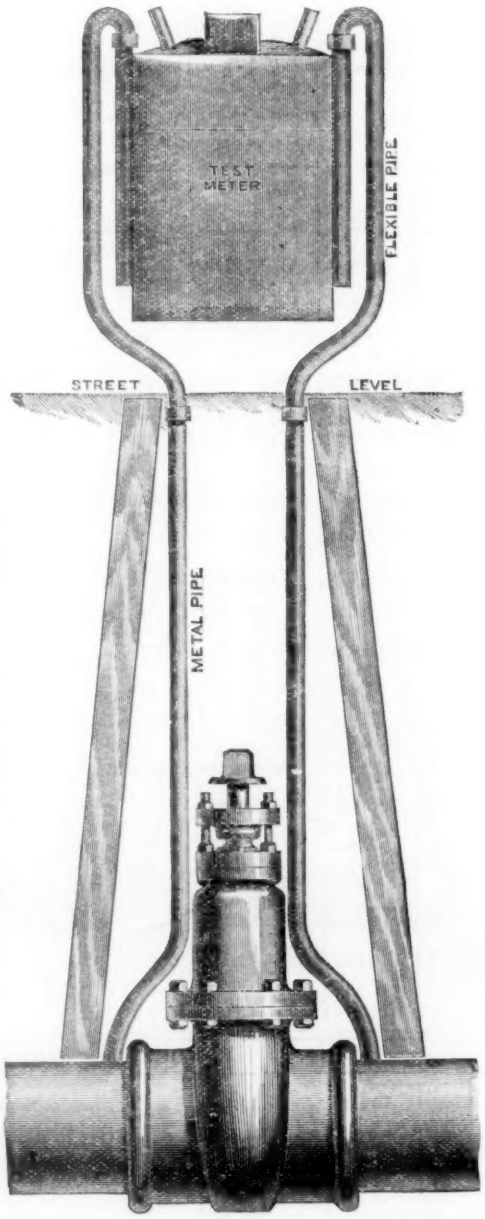
"The lack of valves properly constructed, and so placed as to isolate the burnt district, led to terrible loss, exposed us to the inconvenience and peril of total darkness during two nights, and endangered the whole city. The company have undertaken to repair this error by providing sliding valves. The risk arising from the impossibility of isolating a burning district should never be incurred again."

Since the great fire, the Boston Gas-Light Company have placed in their street mains over seventeen hundred sliding valves, to control the passage of gas.

### Leakage.

I have prepared a plan to illustrate some trials I have recently made, to determine and to remedy the waste of gas from street mains connected with the works under my charge. It shows a section in which there is laid down 43,500 feet of pipe, from which the supply of gas can be cut off by a single valve, the position of which is shown on the plan at No. 1.

In determining where a leak is to be found I use a meter specially constructed for the purpose, with a dial on the top divided into tenths of a foot. Connection is made with this meter by flexible pipes, on each side of the street main valve, as shown in the drawing, so that the valve being tight, any gas escaping from the main beyond it must pass through



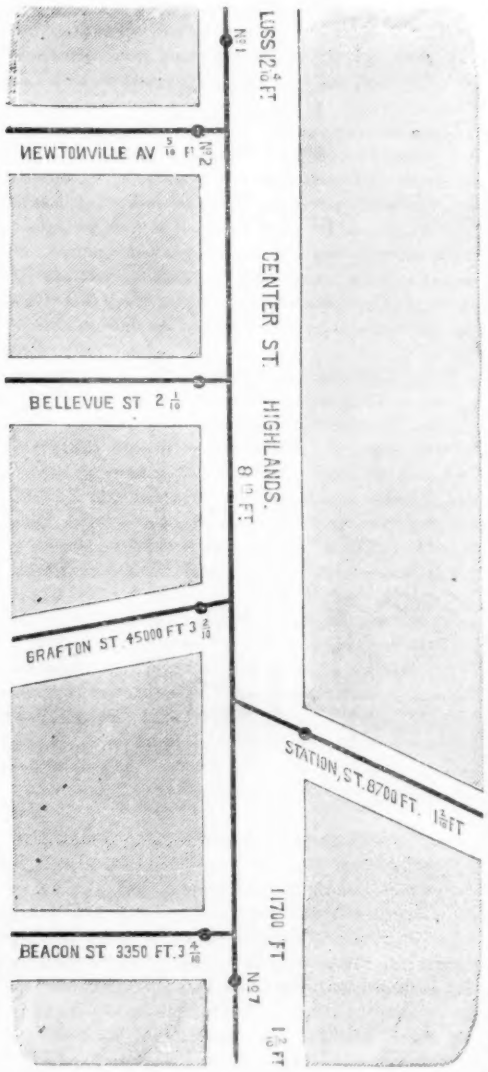

the meter. In the trials referred to I first made a connection with the main in the manner described on each side of valve No. 1, the valve being closed, and found that in ten minutes the meter registered 12 4-10ths feet, equal to 74 4-10ths feet per hour. This then was the leakage beyond that point.

I then connected the meter in the same way on each side of the valve marked No. 7 on the plan, this valve being closed, and found that 12-10ths feet passed through it in ten minutes, equal to 7 2-10ths feet in an hour. This showed clearly that the principal leakage in this section of mains, must be between the points on the plan marked by the two valves numbered 1 and 7. In this manner all parts of the main between each two valves were tested with the results indicated by the figures marked on the plan, and the defects remedied.

It is evident that by the same means we may determine if any particular valve is tight. As a consequence of the trials referred to a large saving has been effected not only in gas, but in labor. Before the introduction of valves in our mains our cost for repairs upon them was from $800 to $1500 per annum on less than thirty miles of pipe! Since that time, by aid of the means described for finding leaks, this cost has been reduced below $400 per annum upon forty-five miles of main, while the loss from leakage and condensation, which averaged 18 per

cent. on the former (less than thirty miles), has been reduced on the latter (forty-five miles) to 8 per cent., showing a saving of 10 per cent. of gas on an increased length of main of over 50 per cent. I may here remark that the entire cost of the valves in the mains was less than $1000, and that this has been covered by the saving in labor in detecting and remedying leaks during the past year, irrespective of the greater saving of gas.

It may be urged as an objection to the method described for determining the position of leaks in mains, that in many districts it may not be applicable be-




cause of the consumption of gas on the line of pipes in the day time, or during the time of the trial, but this may be obviated by keeping a register for several days, of the gas consumed at a given time, and determining the average consumption, or better by requesting the consumers on the line to discontinue the use of gas during a certain hour on a given day, or by shutting off the gas at such time, from all the meters connected with the particular line of mains to be tested.

I trust I have said sufficient on the subject, and if it leads to effecting an important saving to a single gas company, or the saving of a single life, I shall consider that I am amply repaid for my labor, and I trust that you will also be repaid for the time I have occupied.

At its conclusion the President said: Gentlemen, there are two more papers to be read, and it may be expedient to dispense with discussions and remarks until after these two papers have been read, and then if there is any time, devote it to discussions. We meet to-morrow at nine o'clock, and have only two hours, until 11 o'clock, and if there is no objection, with the understanding that the members can recur to this paper, after these remaining papers are read, we will proceed with the reading of papers, and I will call upon Mr. Benson to read his paper "On the Temperature of Retorts at different periods of the Charge."

## Temperature of Retorts at Different Periods of Charge.

By Frederick S. Benson, Engineer Nassau Gas-Light Company, Brooklyn, N. Y.

The subject of heats of retorts at different periods of their charge, having been made a matter of record at the annual meeting of the New England Gas-Light Association in February of the present year, from data furnished by M. S. Greenough, Esq., of the Boston Gas Works, and published in the American Gas-Light Journal, vol. xxvi, page 102, it might not be out of place to add another page to this history, a brief account of a series of experiments performed at the Nassau Gas-Light Company's works, Brooklyn, being made the subject thereof.

The settings employed in these experiments were clay retorts, 14" × 26" × 9 feet, sixes, and are what is commonly known as skeleton, viz., a barely sufficient quantity of brick and tile to properly support the retorts and no more. These benches being so widely dissimilar to those used in the experiments at Boston, mentioned before, afford a fair comparison between the two theories of setting retorts, one assuming that the least quantity of brick and tile used, after the retorts are properly shielded from the direct action of the flame on the former is more profitable, thus leaving the retorts to more quickly recuperate from the effects of a fresh charge of coal, or of cleaning the furnace fire, and attain their maximum temperature, although they way show a lower temperature during such time.

The other—that a larger amount of brick and tile employed in the setting is more favorable, from the fact that such tile serve to store or accumulate the heat attained during the latter portion of the charges, and in so doing, retain the heat of the bench at a more equable temperature, or with less sudden variation, during the operations of charging retorts or cleaning fires.

There can be no question as to the theoretical damage to retorts by a constant rise and fall of temperature of any great extent, yet practically such variations as were shown to exist by the experiments about to be explained, were not worth taking into consideration, and it will be shown by the following data, that such large variations, or extremes of temperature, as might be expected, or that have commonly been supposed to exist, are not obtained.

The same general apparatus and formula were used in this case, as well as weight and description of coal as that used in the invest igation mentioned before, that the results might be compared as to the different settings, and as the apparatus and formula may not be fresh in the memory of members, I will venture to explain them.

Two pieces of iron were used, weighing as nearly five pounds each as possible; these were round and provided with an eye in the end to facilitate their withdrawal from the retort. A frame or truck to slide these irons to about the centre of the retort, and on the top of the charge of coal; the object being to have them as nearly as practicable, in the same position in the retort in every instance; these trays were supported by legs in the mouth-piece, and by two standards in the rear end. A galvanized iron receptacle for holding forty pounds of water, two standard thermometers accurately divided, two wooden paddles to agitate the water in the iron box, that it might be of even temperature throughout, and hooks to remove the irons from the retorts while hot, and transfer them to the water for immersion.

The process consisted in placing the trays for the irons into the retort after it was charged with coal, with one of the irons on the same, a wire hook attached to the iron, and coming out so far front as the lid, and closing the lid.

At the expiration of thirty minutes the lid was struck (this operation being rendered comparatively easy by using the patent Eureka lid), another hook inserted into the eye of the hook already in the retort, and the iron drawn forward to the front of the retort, the first hook was then allowed to drop to the floor, and it was carried to the water and immersed, at the same time a fresh iron was substituted in the retort and the lid closed

The average time that elapsed from the time the lid was opened till it was closed for this portion of the experiment was twenty-eight seconds, and the average time from the instant of opening the lid to the time the iron was immersed in the water was ten seconds. It will therefore be seen the iron had those ten seconds to part with a small portion of the heat, but as this was a constant quantity throughout the series of experiments, a fair comparative result could easily be obtained.

Before the immersion of the iron the temperature of the water was carefully noted, and after the immersion the rise of temperature of the water as indicated by the thermometer, carefully observed.

When the iron was exactly the same temperature as the water, which was ascertained by placing the back of the thermometer in contact with the iron, a note was made of the water's temperature.

The following formula was then used to ascertain the maximum temperature of the iron (supposing the temperature of the retorts to be the same):

$$T = W \frac{o - t^{\circ}}{w\,x} \times O$$ in which T = temperature of retort.

W = weight of water.

C = temperature of water after immersion.

t = temperature of water before immersion.

w = weight of iron.

x = Specific heat of iron.*

*Assumed to be .126

At the date of the first experiments there were but four benches under fire—three on one side of the retort house and one on the other. Of these the middle bench was selected, having a working bench on each side, and one at the back, thus giving a fair result of any bench, should they all have been under fire. The two middle retorts were selected for the experiment, it having been shown by trial that they were a fair average heat of the whole bench.

The first trial was made on Friday, July 20, 1877, commencing at 11.30 A. M., or thirty minutes after the charge had been made.

The bench was charged with 1380 lbs. of coal, 230 lbs. to each retort, of which 50 per cent. was Block House from the Provinces (very fine), and 50 per cent. Penn (good run); two irons were used, one being placed in the same retort after the first was withdrawn, and thus alternated during the whole four hours of the charge; each iron was therefore exposed to the heat of the retort thirty minutes.

The temperatures obtained were as follows:

| | | | |
|---|---|---|---|
| ½ | hour after charging | ..... | 1.437°.5 |
| 1 | " " | ..... | 1.585°.5 |
| 1½ | " " | ..... | 1.730°.5 |
| 2 | " " | ..... | 1.776°.0 |
| 2½ | " " | ..... | 2.009°.0 |
| 3 | " " | ..... | 1.920°.5 |
| 3½ | " " | ..... | 1.953°.5 |
| 4 | " " | ..... | 1.929°.5 |

Average temperature of whole four hours 1.793°.

The falling off of temperature at the third hour of the charge may be attributed to a fresh charge of coke in the furnace fire, which was made just before that time, but the decline in temperature at the fourth hour, or at the end of the charge, when it is commonly supposed the retort would attain its maximum heat, is not so easily accounted for.

The yield of gas per pound of coal during this experiment was 5.34 per lb., 11.962 cubic feet, per ton of 2240 lbs. and the production of the bench in 24 hours, 44,214 cubic feet.

By reason of the small consumption at the date of this experiment, four benches were somewhat in excess, and three as much behind our needs. To obviate the necessity therefore of missing charges on account of filling our holders, the plan was adopted of reducing the charges of coal in each bench to as much as would yield the requisite amount of gas, and the amount at that time used, 230 lbs. to each retort, was largely behind what the benches would carbonize, if necessity required.

It will plainly be seen, therefore, that as far as the average, or common amount of work performed by the retorts, the above experiment was in no degree a fair statement. To remedy this, and obtain results when the retorts were carbonizing the charge of coal customarily used, viz. 260 lbs. (although at the present date 270 lbs. are being used), another series of experiments were inaugurated on July 24th, after the bench had fair time to attain an increased temperature necessary to carbonize the additional quantity of coal.

In this experiment dry Penn coal was used entirely, to more nearly attain the same conditions under which similar experiments mentioned before had been performed. The same bench as before was selected and the same retorts, the exceptions being a charge of 260 lbs. of coal instead of 230 lbs. as before.

The results obtained by this latter experiment were as follows:

| | | | | |
|---|---|---|---|---|
| Temperature | ½ | hour | after charging..... | 1.632° |
| " | 1 | " | " ..... | 1.728° |
| " | 1½ | " | " ..... | 1.858° |
| " | 2 | " | " ..... | 1.918° |
| " | 2½ | " | " ..... | 2.114° |
| " | 3 | " | " ..... | 2.147° |
| " | 3½ | " | " ..... | 2.179° |
| " | 4 | " | " ..... | 2.179° |

Average temperature of whole four hours 1969°.

In this case the furnace was refilled on the second hour of the charge, with but a small decline in temperature, as compared with the previous experiment, and also the temperature was sustained to its maximum till the end of the charge.

The amount of coal used in this instance, as before mentioned, was 260 bs. of dry Penn (run of the pile) to each retort. For whole bench 1560 lbs.; yield per pound 5.59; per ton 2240 lbs., 12,522 cubic feet. Production of bench in twenty-four hours, 52,322 cubic feet.

The following deductions are made from these results: Extreme variation of temperature in first experiment 516°; in second experiment 547°, showing that although 13 per cent. more coal was used, the additional temperature was but 6 per cent, while the increased production was 18 per cent. In each instance the amount of coke used in twenty-four hours, per bench, was fifty bushels, or 41 per cent. of the whole amount manufactured per bench in twenty-four hours.

The President—The next paper, and the last, is that by Mr. C. A. White; but before proceeding with that I wish to say here that it is proposed in the morning, as the names of the members are called, to ask them to state the amount of capital paid in by their companies, so that we may know the amount of capital represented here. I see no reason why any member should object to that, as we don't ask for the indebtedness, or bonds, or anything but the amount of capital paid in; but if any member does object he need not tell what the amount is, of course.

Mr. C. A. White, of Rochester, then read the following paper, on the—

### Care and Management of Works

Valuable papers have been read before the Association, at its previous meetings, on the selection or choice of site for the location of works, and have been the means of bringing out rich thoughts that have benefitted all. Perhaps no one of us but has been repaid, and amply so, for the time devoted to study and practical research which its discussion necessitated.

The question is one of deep moment, not alone to us into whose hands its oversight must fall, but to those who are more intimately connected with its construction; involving, as it does, the matter of economy, in building, of manufacture, and dealing especially with the pressure necessary for distribution. These are indeed questions of depth and weight, and, as such, cannot be thrown lightly aside when we are called upon to consider the subject of construction.

But, while this is strictly true, have we not overlooked, what may have seemed a minor point to many of us, that after our site has been chosen, our works have been erected, and we are ready to begin business, we have never given the matter of management and care of our works a single thought.

We have prepared, argued, and debated, time and again, the major premises of construction, and, without ever thinking of the minor premise of management, have endeavored to force a logical conclusion of results.

No point can be logically argued without its premises, nor can results be laid down or premised without not alone study and thought, but practical knowledge derived from both, as to the proper manner of managing our works.

The subject of care and management of works appears, upon first thought, to be simple in the extreme—in fact, too much so to warrant the consideration of the Association, and yet, the longer we dwell upon it, the deeper we endeavor to fathom it, the grander the subject becomes, until it assumes the almost colossal proportions of being the one thing absolutely essential for the success of a gas company.

While I do not propose to give the plan pursued by myself, nor to dictate to you, gentlemen, the manner in which your works shall be conducted; for modesty forbids the one, and to pursue the other course would be presumptuous, I do wish to bring the subject before you as one that I deem worthy of the greatest consideration.

In the review of our subject the retort house presents itself as the first and the essential point. Upon our care in the initial step in the process of manufacture depends our success; so much so is this the case, that the retort-house may well be termed the keystone of our profession, for, though work well done there may be, to a certain extent, impaired in the processes of washing, condensing, etc., nothing in the latter stages of manufacture can be done that will recover what may have been lost by neglect at the beginning.

Newbigging has well placed among his golden rules "Keep up the heats in the retort-house," and high heats are now almost universally acknowledged to be one of the great essentials in the destructive distillation of coal; producing larger returns per pound of coal carbonized, and yet, at the same time has its evil attendants.

In addition to the heats, I deem economy in the work of the retort house a matter of the highest moment, and one most likely to bring about tangible results. I do not mean that false economy that shuts the spigot and leaves open the bung hole. I do not mean that we shall pay our men niggardly wages, but I do mean that we should dispense with all useless and superflous men, that we shall pay those we retain fair, living wages, and exact in return therefor an honest days' labor; for while, in the former case, our yields may be good, the wages of men employed adds materially to the cost of production—while in the latter case we have a fair yield, with but a small labor roll; and it is possible to have good heats with but few men, as they then have an opportunity to do their work thoroughly, the result is not a falling off in manufacture, but an increase, and that at a reduced cost.

But this is not to be obtained without honest endeavor upon our part. We cannot entirely trust the key of our position to our laborers, be they ever so competent or worthy. Nature makes us imitative creatures, and, being such, if we who are in charge of works give, as it were, a passing thought thereto; if, as is the case with too many of us, we merely take a morning and afternoon stroll through our retort-house. Our men being, as I said, imitative, will soon feel that we are not deeply concerned in its management, and will drop into a slow, come-easy style of work, which cannot fail of proving detrimental to the interests committed to our charge. On the contrary, do they see we are alert, calling them strictly to account for any dereliction of duty, they will soon feel that their interest and ours are common, and will work earnestly for their advancement.

It is not possible, in the limits of such a paper, to mention all the devices and plans which have arisen, for the purpose of increasing the results in the retort-house, nor is it my intention to dwell upon them be they good or bad; for though many have been tried in the balance, and found wanting, many yet find admirers.

There is, however, not a doubt in my mind but that, wherever practicable, improved machinery, that has been thoroughly tested and proven good, should be introduced as tending to lessen the cost of manufacture; but, so far, their has been a great hesitancy on all sides to abandon the bridge, which has so far carried us safely, and launch out upon a vast sea of uncertainty; we are in this respect much like unto the children of Israel, crying out for a Joshua to lead us.

Those of you who have been ever led to experiment with any "improved processes" for the carbonizing of coal, or improved apparatus for scrubbing, condensing, etc., etc., know full well that the great drawback which has prevented your arriving at any safe or honest conclusion as to its value, is the fact that you have no detailed statement of results from the old or different methods with which you make a comparison—there has been entire lack of detail in one or both cases.

Heretofore, the main object in all such experiments has been to produce so many feet per pound of coal, with possibly a slight leaning to a record of illuminating value, and, mayhap, an occasional note is jotted down of the working of the exhauster. No attention has been paid to the processes of purification, to the atmospheric influences, nor to the many minor details which go so far to make success or failure a certainty.

So long as this mode of experimenting is continued we can look for no real or beneficial results, as it is but seldom that all the conditions, that a series of experiments with one and the same apparatus, had at different places, will accomplish the same results. This being the case it is necessary, would we have our work prove of any value to ourselves or others, that a correct record of everything entering into the success or failure of our experiments be kept, for then and then only can they, by reduction to adopted standards, be used in comparison with work accomplished by others

These records prove of value, not alone in comparing results of experiments, but in our every-day work. It is not just to compare our yield per pound of coal with that of another, and, because we may have succeeded in obtaining a few hundredths of a cubic foot per pound more than he, claim that our results are better, when, perchance, were the truth known, it was the other way. It is thus easy to see that the necessity of strict attention to details enters not alone into one, but into every point of our economy, and is a matter that should receive serious consideration, as being the most likely to bring us to a proper plane of comparisons, even to that varying and troublesome question "unaccounted-for gas."

It is not my purpose to enter into and discuss the several details or processes now being used in the purification of gas; should I do so I might be deemed the outrunner of some of the many patentees; this being the case I shall only add that unless the care which has been exercised in the early stages of manufacture follow, the increased results we have there obtained, closely to the end, they may be very materially diminished.

There is one subject to which I think all of us should give close attention, as being one most likely to repay us in the increased illuminating value of our gas—and that is, what is the proper temperature of condensation? The old axiom that "thorough condensation is half purification" is one of but little value to us to-day, simply because no one can tell us what "thorough condensation" means—that is, what temperature constitutes or fulfills the meaning of the word "thorough."

Experience has taught us that rapid or sudden condensation is a great evil; and yet, to-day, works are constructed in which the gas is plunged into a water bath not ten (10) feet from the hydraulic main and, not content with this shock, is led into condensers not two feet further on; the only wonder is that there are any illuminants left in the gas when it reaches the holder. In connection with this thought let us look for one moment at the proper temperature of registering at the station meter—this, as well as photometrical observations, etc., has always been allowed as 60°Fahr., with the barometer at 30 inches.

Now, if this be the proper temperature to represent gas at its standard volume, surely thorough condensation cannot mean a temperature below that point, but some point so much above it only as will lose the additional degrees of heat in its passage to and through the purifiers.

At my works I endeavor to keep the temperature at the outlet of my second condenser, at 70° the gas then reaching the meter at or near 60°.

We are well aware that all aeriform bodies expand 1-480 of their bulk, at 32° Fahr., for every additional degree of temperature, or about 1% for every 5°, consequently the temperature at which the make of gas is registered and distributed from the holder, would, if carefully observed, go far to dispel some of the gloom which seems to pervade our heavy leakage account. For instance—a ton of coal yielding 10,000 cubic feet as registered at 60°, would, if registered at 70°, increase to 10·196 cubic feet, quite an item to the credit of manufacturing account; but if the gas is distributed at 60°, it falls back to 10,000 cubic feet, and we are obliged to place 196 feet to leakage account—this added to condensation in mains goes far to make up the major portion of our "unaccounted-for gas."

It is thus but too apparent that what may seem the minor details of our works are among the most important, do we look for solid results, and though such small nothings are apt to prove annoying and vexatious, at the outset, if they are honestly and thoroughly adhered to, will go largely to ensure success, and it is this minutiæ, more than all else, that requires our personal supervision, for while our foremen may be faithful, yet it is hard to instil into their minds the necessity of so much care over a few degrees, more or less, in the temperature of the gas.

Gentlemen; if cleanliness is next to Godliness, methinks there is no place in which it is more necessary than at a gas works. No time is squandered that is devoted to the cleaning and care of machinery, rather does it repay, in its better working, all such labor; I can conceive of no reason why the engine, exhauster, etc., should not at all times put on holiday attire. Order in the retort-house is more than law, and its results apparent on every hand. Not alone this, but the floors, from the retort house throughout, should be kept scrupulously clean. The old saw—"a place for everything and everything in its place," was, methinks, especially given birth to for our benefit. There are two reasons for this—the one, when the tools are needed there may be no delay if they are properly placed—the other, by it we instil in our men a feeling of pride.

I care not what manner of men we may have around the works, if they are in any wise fitted for the labor they are called upon to perform, if they are early taught that their place must be kept clean, they will soon come to pride themselves upon the appearance of the space before their bench, and a rivalry as to who shall be the cleanest will be the result.

Again; while I am not here to read an essay upon landscape gardening, I do feel that too many of us who have the yard room neglect to care for it, but leave it as a dreary waste, an eyesore to all who may happen our way; a few moments in the day will soon put our yards in shape. Let the heaps of old iron, broken barrows, and such like, that are now piled up as monuments to neglect, be banished and let grass-plats take their place—add a few flowers, and let it all be done by your own men during leisure moments—under your supervision, and you have brought them into contact with a refining influence which cannot fail of good effect. Not alone this, you awaken a feeling of pride; they look upon this change as the result of their labor, they have an interest in it; and, believe me, but a short time will elapse until they are as deeply interested in its success, if not more so, than yourself.

There are many I know think this fancy, gentlemen; practical experience has demonstrated to me that it is truth.

Others may say that it is expensive; to this I reply—not necessarily so.

If you aim to complete all your plans at once it will necessitate the employment of outside labor, would prove costly, and, worse than all, would rob the thing of its charm. Simply take a small portion at a time, complete that, plant your flowers, and you have laid down the foundation stone of what shall prove a source of pride and pleasure, not alone to you, or those who may visit you, but to your employees; and, more than all, you have won them, without a seeming effort, to greater neatness and despatch in all their work.

Well does Matthews say, in speaking of details in business, "does not experience prove the sagacity of these observations? In the case of gifted men especially, what cause of failure do we find more fruitful than that here indicated? Their souls fire with lofty conceptions of some work to be achieved; their minds warm with enthusiasm as they contemplate the object already attained; but when they begin to put the scheme into execution, they turn away in disgust from the dry minutiæ and vulgar drudgery which are required for its perfection. Hence the world is full of mute, inglorious Miltons, who languish, not from lack of ability, but because, in spite of their many brilliant parts, they lack something which the famous possess."

Thus we see, gentlemen, that constant watchfulness in all departments of our profession may well be added to the list of golden rules. Our lives will be indeed spent, or rather misspent, in planning grand improvements, unless we are willing to watch with a patience doubly told every detail, not alone of its construction, but its useful management and working.

We can no more look for success, by neglecting the minutiæ of our profession, than can the general, who while he may plan some grand achievement, hope for victory to perch upon his banner, when he leaves the entire detail of his campaign to subordinate officers.

History never fails to repeat itself: and the methods of success in years gone by were the same as those of to-day.

In conclusion, gentlemen; if to the patriot of old "eternal vigilance was the price of liberty"—to us eternal watchfulness is the price of success. Would we win results from the works in our charge, ours must be the brain to devise, ours the wisdom to direct and the thoughtful energy that shallovercome all obstacles, and snatch, as it were, success from apparent failure; and while history may not carry our names with sounding praise to future generations, perchance a satisfied board of directors may, for a moment, dwell with kindly remembrances on the man who has spent himself in their service; but over all, and above all, will and must come to our minds that satisfaction, that rest of conscience that ever follows a full and faithful performance of duty.

The President—I was mistaken about Mr. White's being the last paper, but before we hear the remaining paper read, I will state that there is an application for membership from Mr. R. C. Terry of Philadelphia, and Mr. Cartwright moves that the secretary be authorized to cast the vote of the Convention for the gentleman.

The chair then appointed Capt. Dresser teller, to receive the ballots, which was done, and Mr Terry was declared duly elected as a member of the Association.

The President—There should have been a report of the Committee on Statistics before now. Has there been such a committee appointed?

Receiving no response to this question, the chair proceeded to appoint Messrs. McIlhenny, Henry Cartwright and A. B. Slater, as a Committee on Statistics.

Mr. Henry Cartwright then moved that the reading of the remaining paper be dispensed with, until the morning session.

This motion was carried, and a motion for adjournment was made by Capt. White, which was seconded, but by consent was afterwards withdrawn.

The President—I am ready now to entertain the motion for adjournment.

Capt. White then renewed his motion, which was carried, and the Convention adjourned until nine o'clock, A. M.

## SECOND DAY.

### Morning Session.

The Convention assembled at 9.30 A. M., and was called to order by the chairman, who read the subjects of the last three papers to the members of the Association, and said: I owe an apology to those members of the Association who have been waiting here since 9 o'clock, but a very important meeting was being held by the Executive Committee, and as presiding officer of that committee I could not well leave. To tell you the truth, gentlemen, the time that is allowed us for discussion is too short. We ought to have had at least two whole days and perhaps three. [Applause.] Now in the discussions of these last subjects members must necessarily be very brief, so that we can accept the hospitalities of the Cincinnati Gas-Light Co. at 11 o'clock. I trust in future we will have two days, and I would like it better if we could have three days, and then we would have plenty of time for all the subjects to be thoroughly presented. It was proposed that when calling the roll this morning we ask each member as his name is called, to give the amount of capital paid in by his company. There is a very small attendance this morning, and perhaps that matter better be deferred. What is your pleasure?

Mr Starr—I move that the roll be called at 10 o'clock. Carried.

The President—The first subject before you for discussion, if you see fit to discuss it, is "Valves in Street Mains." Now, be very brief, and speak to the point, and no member speak but once, except by permission of the Association.

Mr. Starr—I will just say I have been doing that for ten years. We have fifteen miles of pipe in which we have eleven valves, and we like them very much indeed.

The President—If there is no objection we will lay aside the discussion until some business of importance is transacted. The first thing is the report of the committee appointed to prepare some suitable memorials upon the death of members.

Capt. Dresser, for the committee, read the report as follows:

*Whereas*, By the inscrutable wisdom of Providence, our fellow-members and co-laborers, Messrs. W. H. Perry of Bangor, Maine; Charles Collier of Selma, Alabama; and George T. Sutton of Peekskill, N. Y., have been called from the varied and darkened cares of this world, to a purer and brighter home; and

*Whereas*, It is but proper that we pay suitable respect to their memories,

*Therefore Resolved*, That in their deaths this Asso-

ciation has lost interested and worthy members, whose decease we sincerely deplore, and to whose merit and true worth we hereby bear evidence.

*Resolved*, That we tender to the families of the deceased, our warmest sympathy in their bereavement.

*Resolved*, That a copy of these resolutions be spread upon the minutes, and a copy sent to the respective families of deceased.

W. H. Denniston,
William Dunbar.
William A. Stedman.

The President—I will suggest that a standing vote be taken as to the adoption of this report. As many as are in favor of adopting this report please rise. Carried unanimously.

The resolutions offered by the Executive Committee were then read in their order and adopted by the Association. They were as follows:

*Resolved*, That for the considerate attention given for the comfort and pleasure of the members of the Association, during the Convention held at Cincinnati, the hearty thanks of the Association be tendered to Gen. A. H. Hickenlooper, President of the Cincinnati Gas-Light and Coke Co.

*Resolved*, That the cordial thanks of the Association be, and are hereby extended to Capt. G. Warren Dresser, Editor of the American Gas-Light Journal, for his active exertions in promoting the interests of the Association; and to assure him of the hearty co-operation of the members to further the success of the Journal, by increasing its circulation.

*Resolved*, That the duties of the Secretary of the Association having been so satisfactorily performed by Mr. Charles Nettleton, it is but eminently proper that in appreciation of his invaluable services, the thanks of the Association are hereby tendered to him.

Mr. McIlhenny—I have an addition l resolution to offer. I move that the sense of this Association is that our thanks be tendered our presiding officer for the efficient manner in which he has presided over our meeting. The motion was unanimously carried.

The President said: I thank you for this token of your appreciation. I was very unexpectedly called upon to fill this position, and was not sure that I should discharge the duties in a manner becoming so honorable a position as presiding officer of this Association. I think we have had a very pleasant meeting, and I only regret that it will be so short. I have done my best to further the interests and business of the Association, and have been as expeditious as possible. I think we have transacted a great deal of business, and what has been said and done here will be of great benefit to the gas-light companies of America, not only those represented here but all others.

The proceedings of the meeting, the papers read, and the discussions, will all be printed in the American Gas-Light Journal, so that every one will have an opportunity to read them. Again I thank you. [Applause.]

A Member—The last paper read last evening was presented by Mr. Patton, I think, "On the price of gas." It is of too much importance to pass over in this hurried manner. There are some points worthy of considerable discussion, and I hardly think it proper that that paper as it is should be endorsed by the Convention and given to the public as such. I, myself, don't feel ready to endorse it, and think the paper had better be laid over for another year, and I now move that the paper be left in the hands of the Secretary, to be re-read for discussion at the next meeting of the Association.

A Member—I would make this suggestion—that the paper be referred to a committee of our most intelligent gas men, and let them consider and report upon it at the next meeting. I would make it the Executive Committee, and let us hear from them.

Mr. Cartwright—It certainly is not desirable to have that paper come forth as our opinion, without more mature deliberation, and therefore I think it had better be postponed, without leaving it to any committee.

Mr. Denniston—This paper was before the Executive Committee, and it was not desired to choke any body off, but at the same time it was expected that there would be a discussion of the paper, and now that it would be impossible to give it the time it ought to have, I think it should be postponed. When the committee passed upon it, it was supposed that the paper would be fully discussed, and I think it should not be submitted to the Executive Committee without a general discussion.

Mr. Butterworth—I hope the motion will prevail, because we have had so many things of that nature that have not been necessary, that I would be very glad to have this paper discussed, and therefore I would like to have this paper postponed. Mr. Patton is not here to answer for himself, but I am sure he would be perfectly willing to have the paper go over.

Capt. Dresser—It seems to me the whole matter is very simple. As I understand it, this Association is not afraid to meet any question, but when they publish the proceedings to the world they want to publish both sides, and therefore it seems to me to be best to lay this paper over for discussion. I think it an act of courtesy to Mr. Patton, as he is not here to answer for himself, and also that it will be serving the interests of the Association, to lay the paper over for discussion next year.

The motion was then voted on and unanimously carried, which laid the matter over until the next meeting of the Association.

The President—The Special Committee on Leakage and Unaccounted-for Gas are now ready to report.

The Secretary—If any gentleman present has suggestions on the subject we will be very glad to have them made here for the benefit of the committee, or furnished to the Secretary at any time during the year. The committee have nothing to report now, but ask that they may be continued until next year.

A Member—Gen. Hickenlooper is now in the room, and I think it would be well for the President to inform him of the resolution passed by the Association.

The resolution was then read by the President, to which Gen. Hickenlooper said in response: I simply desire to say, of course you have my heartfelt thanks for the kind compliment, but I would suggest, as a matter of propriety, that the names of the directors of the Gas-Light Company be substituted for my own, for it is through them that I am enabled to extend to the Association the hospitality of the city.

Mr. Forstall—I move to amend the resolution by inserting the names of the directors of the Cincinnati Gas-Light Company, in addition to that of General Hickenlooper.

The amendment was carried, and the names inserted by the Secretary.

The President—I might for your information state, that the matter of printing the proceedings of this session came before the Executive Committee, and it was decided not to print them this year, but to print them for two years, binding them together. The expences for one year would be nearly as great as for two, and as the proceedings will be printed in full in the American Gas-Light Journal, you will all have an opportunity to read them; and I have no doubt a sufficient number will be printed, so that every one who desires can have one, two, three, or more duplicate copies as he may desire. Therefore, unless there is some motion offered to print, there will be nothing done with regard to this matter.

Gen. Hickenlooper—I would like to say to the members of the Association that the trip, as expected to be taken, will render it necessary for us to adjourn promptly at 11 o'clock. I have made arrangements for a small drip on the main line, and I suppose there will be some little absorption there. [Laughter.]

Mr. McIlhenny—I would like to say that if any gentleman going home can make it convenient to go through Washington, I will be very glad to see them, and will show them the handsomest city in the world.

The President—The roll call will now be proceeded with. Is the Committee on Tabulation of Statistics prepared to report?

Mr. McIlhenny—No, sir, the committee are not ready to report, and ask for further time.

Upon motion further time was granted the committee.

Capt. White—The time for our adjournment is rapidly approaching, and if we are to hear from Mr. Goodwin on the subject of his apparatus, I think we had better get to work at once, and I therefore move that we postpone discussion on the papers read, and listen to Mr. Goodwin. Carried.

Mr. Coggshall—Before calling on Mr. Goodwin, I hope the chair will entertain a motion I have to offer, to the effect that the Executive Committee be authorized to extend the time of meeting to a three days session. The motion was seconded, and remarks being called for.

Mr. Starr said—I have been a member, this is the third annual meeting, and my feelings were this year, that if I had to go to New York, with the hurried manner in which we have done our business, I would not have gone, but if you take three days I would go. I go to learn something, and I am very glad the motion has been made, and if it is carried I hope those three days will be devoted to business, and not to eating and drinking.

The motion was then voted on and unanimously carried.

Mr. Slater then moved that the thanks of the Association be tendered to those gentlemen who have presented papers to the Association, which was accordingly done.

Mr. Slater also suggested the papers which had been read "On Street Mains" and "On Competition," would be very interesting reading for the public, and he hoped the members, if they saw fit, would cause them to be published in the daily papers of their respective cities, and Capt. Dresser stated that if any of them wanted slips he would be glad to furnish them from the office of the American Gas-Light Journal.

Mr. Goodwin was then called on for a description of his apparatus for gas analysis. Before describing the apparatus he said: I wish to say that I have no interest whatever in any patent process for the manufacture of gas outside of coal. I say this because I have heard since coming here, that I am largely interested in some patent process, but it is entirely false.

REMARKS OF MR. GOODWIN,

*Mr. President and Gentlemen, Members of the American Gas-Light Association:*

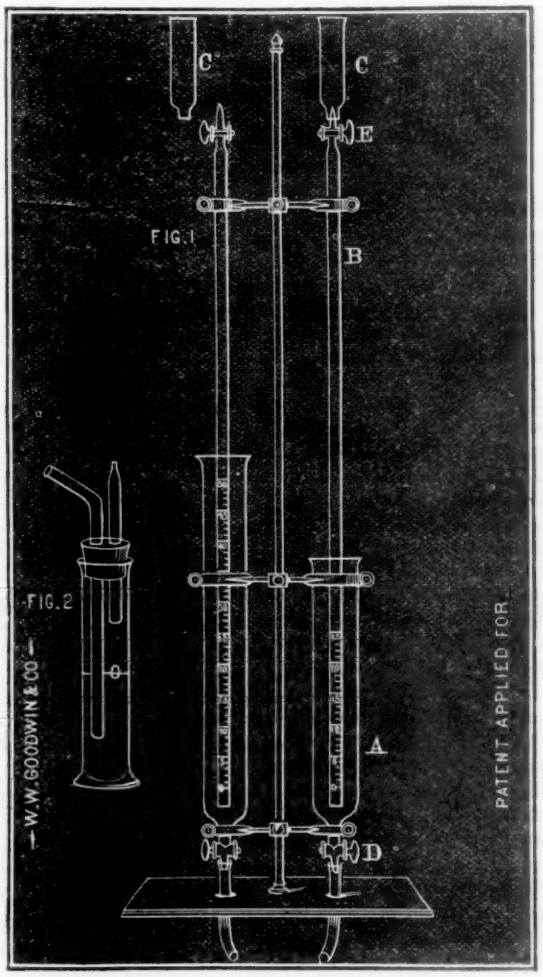
Heretofore, the apparatus, expense, time, and knowledge of chemistry required in the analysis of gas have been very great, as compared with the method and apparatus I now propose to call your attention to; for instance, in the matter of expense. A professional gentleman having been employed to make an analysis of gas, expended on account of the company over one hundred dollars for mercury alone. The time used up in making the analysis covered several weeks, and the expense to the company was over one thousand dollars.

By the method about to be presented to you, the analysis could have been made within one hour—that is to say, so far as its *practical value* to the company was concerned. I do not desire to be understood as objecting to the methods of *exact* analysis as promulgated by Bunsen, Bowditch, or Sutton. What I claim is that for all *practical* purposes the constituents of gas and their relative per cents to each other, so far as their value to the gas man is concerned, can be determined at an expenditure of time and expense, infinitely small as compared to the old methods, and within the general knowledge of any gas engineer. Your acquaintance with the variable constituents of your gas should be as positive as your knowledge of its photometrical value.

I claim this information is, or should be, of great importance to the members of this Association, particularly in these days of new and patented processes or the manufacture of gas, which are constantly be-

ing brought before you, with a persistent urging of the purchase of the same, with the alternative in the event of a refusal on your part to buy, of the establishment of an opposition company in your midst, resulting in a gas war involving the sacrifice of large monied interests, animosity, and bitterness of feeling. After the parties having these various processes for sale, urge upon you their claims and personal knowledge, of how to furnish cheap gas for the million, with a persistance and tenacity really astonishing; when their actual knowledge of the practice and chemistry of gas-making is considered. In these remarks I wish it to be distinctly understood that I am not referring to any particular process or method, as their name is legion, but rather in general terms.

I claim for this new method of analyzing gases that it is an easy and rapid mode of determining the value of a process for gas manufacturing when brought before you for, as already stated, the difficulty attending the solution of the question as to how much of




this, that, or the other constituent contained in any given gas has heretofore been so great that weeks may elapse before an analysis can be completed, whereas had the means been at hand for a short and easy manner of analyzing the products of new processes, possibly a less number of opposition companies might have been in existence to-day.

In the destructive distillation of coal the following gases are produced: Ammonia, ($NH_3$); Sulphuretted Hydrogen, ($H_2S$); Carbonic Acid, ($CO_2$); Air or Oxygen and Nitrogen; Bisulphide of Carbon, ($CS_2$); Olefiant Gas ($C_2H_4$); Acetylene, etc., ($C_2H_2$); Carbonic Oxide, (CO); Light Carburetted Hydrogen, ($CH_4$); Hydrogen, (H).

The first four of these gases on the list, although often present in well made gas, are generally considered impurities, and by right should not be there.

The apparatus will determine the presence of the above gases and their quantity.

The re-agents used in this method are: 1. Dilute Sulphuric Acid. 2. Solution Nitrate Silver. 3. Solution Arsenious Acid. 4. Solution Iodine. 5. Bromine. 6. Solution Caustic Potassa. 7. Solution Pyrogallate Potassa. 8. Solution Sub-Chloride Copper in Hydrochloric Acid. 9. Lime Water. 10. Red Litmus Water. 11. Solution Acetate Lead.

In order to make an analysis of coal gas by this method, we must first make what is known as a qualitative analysis, that is, determine the presence of certain gases; this will decide the order of precedence in their removal.

For this purpose we use apparatus No. 2, which is so constructed as to admit the gas to be bubbled through any liquid we may place in it. Thus if the gas is suspected to contain ammonia, ($NH_3$) we fill the apparatus (to say the O line,) with a solution of red litmus, and allow the gas to pass through the liquid for several minutes; if ammonia ($NH_3$) be present, the red litmus will turn blue.

If carbonic acid ($CO_2$) be suspected, we fill to O line the same apparatus (after washing,) with lime water, then pass the gas; if a white precipitate is formed, carbonic acid ($CO_2$) is present.

For detecting sulphuretted hydrogen ($SH_2$), we carefully cleanse the apparatus, and fill to the O line with a solution of acetate of lead; now pass the gas. If in a short time the liquid turns brown or black, the presence of this gas ($SH_2$) is shown. Carbonic acid ($CO_2$) will give with this solution a white precipitate, but if sulphuretted hydrogen ($SH_2$) be present also, the white will turn brown or black.

Having determined the presence or absence of these gases, we are now ready to use the second apparatus for determining the per cent of these and other gases.

Place the apparatus Fig. 1, as shown in drawing, fill the funnel A with water that has been standing in the room until it has acquired the same temperature; we now adjust a flexible tube upon the tip of Eudiometer B, open the stop-cock E, and by exhaustion fill the tube with water from the funnel A; when full, close stop-cock E, and remove flexible tube, which is now placed upon a jet and the gas to be examined is allowed to pass through it for a minute or two. While it is thus passing freely we place it on the tip of the eudiometer; by opening the stop-cock E the water will flow out and the gas will take its place. By opening the stop-cock D of funnel A the water will be drawn off until the gas fills the tube to the O point, when the stop-cock D of funnel A, also the stop-cock E of tube B are closed.

Now place the funnel C upon the tip, which completes the first part of the operation.

If in our qualitative examination we have found ammonia ($NH_3$) and sulphuretted hydrogen, ($SH_2$) we proceed to determine the per cent. of ammonia ($NH_3$). For that purpose we introduce about ½-ounce of *dilute* sulphuric acid in the funnel *C* and gradually open the stock-cock E and allow it to flow down the tube, always leaving a little of the liquid in the funnel to prevent the introduction of air. A few minutes will be required for the liquid to subside, and the rise of the water in the tube will indicate the per cent., when we have drawn off the water in funnel A to the same level as the liquid in the tube B; this must always be done at each reading of the different gases.

It is also well to place in funnel C a little pure water to cleanse it after each reagent.

A better solvent for ammonia ($NH_3$) is a solution of nitrate of silver mixed with a solution of arsenious acid in equal quantities; this cannot be used if sulphuretted hydrogen ($SH_2$) be present.

For sulphuretted hydrogen ($SH_2$) we place in the funnel *C* a solution of arsenious acid, and allow it to flow down the rise of the water in the tube will indicate the per cent. of this gas. ($SH_2$)

When we find ammonia ($NH_3$) we do not find carbonic acid ($CO_2$) and *vice versa*. So if our qualitative examination shows carbonic acid ($CO_2$) we commence our quantitative analysis for this gas instead of for ammonia ($NH_3$). Its well-known solvent is a dilute solution of caustic potassa, about one-half oz. will be sufficient to place in the funnel *C*; when passed down the tube it causes a rapid absorption, and the rise of water shows the per cent.

For bisulphide of carbon ($CS_2$) one-half ounce of solution of iodine in water is placed in funnel *C* and carefully allowed to flow down. The rise of water gives the per cent. ($CS_2$.)

We next absorb the illuminating gases, which, in all probabilities, will be a mixture of olefiant gas ($C_2H_4$), acetylene ($C_2H_2$), per-carbide of hydrogen, and the vapor of benzole. These are all acted upon and dissolved by bromine; to use this very heavy liquid, we first place in funnel *C* one-half ounce of water, and for coal gas two or three drops of bromine (for naphtha gas ten to fifteen will be required) and very carefully allow the bromine to flow down. It will fill the tube with a red vapor, if we have added enough, and will cause an expansion of the gas in the tube instead of contraction. After a few minutes we place in funnel *C* one-half ounce of solution of caustic potassa with the vapor already there, and allow it to flow down; this will absorb the red vapor, and the rise of water in the tube will give the per cent. of illuminants.

For air, use one-half ounce of pyrogallate of potassa, and wash down with water; the rise will give per cent. of oxygen, (O) and as oxygen is one-fifth of the air, we say four times the per cent. observed is nitrogen (N) or five times the per cent. observed is air, and so record it.

For carbonic oxide (CO), use half an ounce subchloride copper in hydrochloric acid; this absorbs this gas, but before reading the per cent. wash with water, and after the water a little caustic potassa is allowed to flow down; the rise of the water gives the per cent.

The remaining gas in the tube is a mixture of hydrogen (H) and light carburetted hydrogen ($CH_4$) plus the nitrogen (N), and will be so recorded. It is seldom necessary to make a separation of these gases, for they both serve to dilute and carry the illuminat-

ing gases. In coal gas they are about equal in quantity.

This completes our analysis, and if the temperature of the room and all the re-agents used have been the same, and we have been careful not to handle the tube with our warm hands, the readings will be approximately correct.

It is well to have a second tube, as shown, filled the same as the one we use, to note any change of temperature.

It is important that the order here recorded be carefully observed.

Capt. White—I move that the thanks of the Association be tendered to Mr. Goodwin for the explanation of his apparatus. Carried.

Mr. Cartwright—Mr. President: I now propose the name of Mr. William King, of Liverpool, as an honorary member of this Association.

The President said—Gentlemen: I have no doubt that if there was time you would wish to speak upon this subject. Mr. King visited this country recently, and a description of his reception in New York is given in the GAS-LIGHT JOURNAL. The limited time at our command prevents my speaking of his merits as they deserve.

The Secretary—The Executive Committee have had in consideration the subject of recommending Mr. King as an honorary member, and they now nominate him as such.

The President—I have received notice from the Executive Committee that they have proposed the name of Mr. William King of Liverpool, as an honorary member of this Association, and it is moved and seconded that the Secretary be authorized to cast the ballot of the Association to that effect.

The motion was carried, and the President appointed Mr. White as teller to receive the ballot, who announced the unanimous vote of the Association in favor of the election of Mr. King.

Upon motion, Mr. Slater was asked to explain a diagram showing the consumption of gas by his company since its organization, which he did.

Upon motion of Mr. Denniston, a vote of thanks was tendered to Mr. Slater for his explanation.

Upon motion of Mr. McIlhenny the Convention then adjourned *sine die*.

## Boiler Explosion in the Pittsburgh Gas-Works.

[Pittsburgh *Evening Chronicle*, Monday, Nov. 5, 1877.]

This morning, shortly before one o'clock, an accident occurred at the Pittsburgh gas works, on Second avenue, near Linden Station, Fourteenth ward, which resulted in the demolition of the boiler, engine and exhauster house, the wrecking of the machinery, and the suspension of the works. A terriffic report was heard about twenty minutes before one o'clock by the employees of the works, and the hissing sounds that followed furnished unmistakable evidence that an explosion had occurred. Almost instantly the engine house was in flames, and an alarm sounded from the Soho police station. The hose at the works was at once put into use, and the 24-inch main leading from the purifying house to the exhauster, which had been wrenched off by the explosion, out of which gas flowed and igniting, set fire to the wood work of the exhauster house. A column of flame fully twenty-five feet in height, caused by gas from this main, rushed up to the roof of the demolished building, but the main was soon cooled, the gas shut off, and the fire extinguished before the fire engines arrived at the scene.

An examination of the premises was immediately made, when it was disclosed that the tubular boiler in the engine house, next the main offices, had exploded overturning the boiler in the lower end of the room, tearing out both sides of the building, from the ground to the roof, cracking the rear wall, breaking the main pipe from the purifying house to the exhausters, in the second floor of the engine house, and completely demolishing the engine and exhauster next to the Linden Station. The wreck of the exploded boiler, engine, and exhauster lay with the debris of the building, against the outside mains on the east side of the building, while on the west side was a pile of brick and mortar, wrenched iron girders, splintered wood work, etc., etc.

Mr. John H. McElroy, Chief Engineer of the works, reached the place at half-past two o'clock, and, as soon as possible, set a gang of laborers at work clearing up the wreck. He found the retorts idle, in consequence of the disaster, and decided that a connection from the purifying house to the mains leading to the gasometer would have to be made during the day, otherwise the city would be without gas at ten o'clock tonight. Accordingly, the men were hard at work when our reporter visited the works this morning at half-past seven o'clock, and the debris had been sufficiently cleared away to allow the machinists to begin the task of cutting the mains to make the necessary connection, and the engineer is satisfied the work will be completed if the outside wall of the wrecked building does not fall and carry with it the other exhauster, which had never been used. Should the building fall it will likely injure the purifying house. Supports have been placed between the last mentioned building and the engine house, or what remains of it, and the remaining machinery will be removed before the walls are taken down.

The engineer, William Faust, who has been in the employ of the company for four years, says there was plenty of water in the boiler, and the foreman, Geo. Bullman, avers he tried the gauges five minutes before the explosion and found them correct. The engineer passed through the engine room a few seconds before the accident, and was on the platform at the head of the stairs leading to the purifying house when the explosion occurred. He was struck by the heavy door and thrown to the platform of the purifying house, which is ten or eleven steps below the exhauster room, but fortunately escaped without serious injury. Mr. Faust was employed at the Novelty Works for a number of years, and is regarded as a very careful and competent engineer. The gas works officers say he seldom was absent from his post of duty, and are of the opinion that the water was foaming when the gauge cocks indicated a plentiful supply, and deceived both engineer and foreman. The brief time which elapsed from the time the gauges were examined until the explosion occurred would indicate that the theory of the water foaming is a correct one. There was a heater in the boiler room, into which the condensed steam passed, and the water for the boilers entered them boiling hot. There could have been no gas generated in the introduction of cold water, and there is no other way of accounting for the disaster other than the theory advanced by Chief Engineer McElroy.

The stone walls of the boiler house were two feet and the brick walls of the engine room 13 inches in thickness. Fragments of the wood work were thrown into the field east of the building, while water, mud, etc., were thrown across the street against the retort-house. The glass in some of the windows of the purifying house and the office was shattered to fragments, and in some instances the sash broken, and the whitewashed walls of the basement, or boiler house, bespattered with muddy water.

The exploded boiler was torn into three fragments, the water end having been twisted into a shapeless mass and deposited in the pump pit. The fire end of the boiler was torn off in a most singular manner, while the other end is completely scalloped. The tubes were driven into the ground, some of them standing on end, while others were doubled up as if they had been placed in the hands of the blacksmith for welding. Had not the outside mains checked the progress of the boiler, it is thought it would have landed in the field near the gasholder. The destroyed exhauster and pipes lay upon the unused boiler, and it is thought that the latter will be almost worthless. The loss, it is thought, will be between $8,000 and $10,000. The boilers were made by Monroe & Co., were of the tubular pattern, and had been in use a little over a year. The engine room was complete in every detail, and the engineers who visited the works say it was the finest in the United States.

Persons living on Craft avenue distinctly heard the explosion, and one man residing on Second avenue, a quarter of a mile below, says the shock raised his bed off the floor and dropped it so suddenly as to wake him from his slumbers.

# Gas-Light Intelligence.

## United States.

GAS IN RIPON, WIS.—A. L. Dobbs, manager of the Ripon, Wis., gas works contemplates having the machinery in readiness to let on the gas in a day or two. —*Eng. News, Nov.* 10.

ANTICIPATING A REDUCTION IN GAS.—Providence, R. I., people are anticipating a reduction in the price of gas for heating purposes to $1 per 1000 feet, and several parties are preparing to attach gas pipes to their furnaces, abandoning the use of wood and coal altogether.—*Ibid.*

RENEWING A CONTRACT.—The Alton, Ill., gas company wants to renew its contract with the city at $4 per 1000 feet, but the people say nix.—*Ibid.*

A GAS FIGHT IN LA SALLE, ILL.—The city of La Salle, Ill., has a gas fight on its hands. The council refuses to pay more than $3 per 1000 feet for gas used in the street lamps, and the local gas company has struck, and refuses to light the street lamps.—*Ibid.*

BIDS FOR LIGHTING THE CITY OF SPRINGFIELD, ILL. —The city council of Springfield, Ill., have opened the bids for lighting the city, and report that the new gas company offer to furnish gas at $2.24 per 1000, or light the street lamps for $19.50 per annum each. The council rejected the bid and will advertise in Eastern paper for proposals.—*Ibid.*

ACCEPTING A PROPOSITION TO LIGHT THE CITY OF LAWRENCE, KANSAS.—The gas company of Lawrence, Kansas, has accepted the proposition of the city council. Henceforth there will be light. The substance of the proposition is that for three years the city will pay the gas company $22.50 per year. This is to include all costs for lighting, extinguishing, cleaning, replacing broken globes and defective cocks; the lamps to be kept lighted until midnight. During three years the gas company will pay the city the sum of $3,300 in equal monthly instalments, which amount will be used by the city to satisfy the claims of Arabella J. Newlin against the city; these installments to be deducted from the bills of the gas company.—*Ibid.*

CONFERENCE RELATIVE TO REDUCING THE PRICE OF GAS IN LOUISVILLE.—The result of the conference between the committee appointed by the Common Council of the city of Louisville, Ky., and the directors of the Louisville Gas Co., relative to a reduction in the price of gas to $2.25 per 1000 feet, is shown in the following letter from the gas company to the committee:

LOUISVILLE, KY., October 11, 1877.

I am directed by the Board of Directors of the Louisville Gas Co. to inform you that it has carefully and fully weighed the statements made by you at the conference with which you honored us yesterday; that it has applied mature deliberation to the subject; that it is actuated by as strong a desire as yourselves to bring down the price of gas to the lowest figure compatible with a just consideration of the interests of the company it represents, and that the unanimous conclusion of the Board was that at present gas could not be furnished at a less rate than $2.35 per 1000 feet. I am also authorized to say that it is the desire

and intention of the Board, if it finds it possible to do so, to make a further reduction at a future time.

HENRY WHITSTONE, President.

The price given in the letter is "nett."—*Ibid.*

PROPOSALS FOR PUBLIC LAMPS, N. Y. CITY.—The Gas Commission will meet in the Department of Public Works on December 7th, for the purpose of opening proposals to light the city with gas for the four months ending April 30, 1878.—*N. Y. Herald, 23d ult.*

REMONSTRANCE AGAINST LIGHTING THE 12TH AND 19TH WARDS WITH NAPHTHA.—A remonstance has been presented to the Board of Aldermen by citizens of the Twelfth and Nineteenth wards against lighting that quarter of the city with naphtha instead of gas. They state that naphtha produces a light of no brilliancy, and that "the stench arising from filling the lamps, together with the danger existing from explosions which frequently occur, renders the system not only objectionable and obnoxious to us personally, but injurious to our property."—*N. Y. Herald, Nov. 23d.*

## Water Supply Items.

WATER WORKS IN PERU, IND.—Peru, Ind., has advertised for proposals for the construction of water works in that city, the bids to be opened October 15.—*Engineering News.*

WATER WORKS IN LITTLE ROCK, ARK.—Little Rock, Ark., has entered into a contract with the Little Rock Water Company of that city for the construction of water works. They are to be completed July 1st, 1878.—*Ibid.*

WATER WORKS FOR MOLINE, ILL.—The city of Moline, Ill., has contracted with Thomas Yates, of Rock Island, Ill., for the construction of water works.

SIZE OF WATER PIPES FOR NEW YORK.—The New York authorities have resolved that hereafter no water pipes of less than ten inches in diameter shall be laid anywhere in that city.—*Ibid.*

INCREASING THE SUPPLY OF WATER IN NEW YORK CITY.—The suggestion for increasing the water supply of New York city, by reopening the old wells and pumps, of which there are a large number in that city, is opposed by Mr. Allan Campbell, Commissioner of Public Works, on the ground that it would be detrimental to the city's health. He adds, however, in his communication to the Board of Aldermen, that it might be well to have a few of these wells driven, to test their capacity for supplying steam engines.—*Ibid.*

## Prices of Gas Coal.

Our quotations continue unchanged, viz.:

| | | | |
|---|---|---|---|
| Westmoreland | $5.50 | $4.50 | at Baltimore. |
| Penn | 5.50 | 4.50 | |
| Despard | 5.35 | | |
| Marion | 5.35 | | |
| Murphy Run | 5.35 | | |
| Newburgh Orrel | 5.35 | | |
| Ches. and Ohio RR. Caking Coal | 5.40 | ($4.10 f. o. b. at Richmond. | |
| Block House | 4.50 | 1.75 | Gold f. o. b. at Mines. |
| Glace Bay | 4.25 | 1.60 | |
| International | 4.25 | 1.60 | |
| Clover Hill | 4.00 | | |
| Cannelton Cannel | 10 00 | | |
| Peytona | 10.00 | | |

Among the arrivals at New York we note a 600 ton cargo of Ince Hall gas cannel, imported for one of our leading gas companies, on private terms. Also, a steamer with 1,000 tons of Block House coal. The extreme low water freights are in favor of these importations of foreign coal.

The freshet on the James River caused a cessation of shipments from that quarter for a few days. They have been resumed, however, and supplies of cannel, for which there have been additional contracts, will come forward freely for the next sixty days.

## Gas Stocks.

**Quotations by G. W. Close Jr., with W. B. Scott & Co., Broker and Dealer in Gas Stocks.**

24 PINE STREET, NEW YORK CITY.

DECEMBER 3, 1877.

☞ All communications will receive particular attention

| | Capital. | Par. | Bid. | Asked. |
|---|---|---|---|---|
| *Gas. Co.'s of N. Y. City.* | | | | |
| Central, Westchester | 466,000 | 50 | 90 | 95 |
| Harlem | $1,850,000 | 50 | 97 | 100 |
| Manhattan | 4,000,000 | 50 | 210 | 215 |
| Metropolitan | 2,500,000 | 100 | 130 | 133 |
| " Scrip | $1,000,000 | .. | 100 | 103 |
| " Bonds | 500,000 | 1000 | 92½ | 95 |
| Mutual | 5,000,000 | 100 | 90 | 95 |
| " Bonds, gold. | 900,000 | 1000 | 105 | — |
| Municipal | 1,000,000 | 100 | 85 | — |
| New York | 4,000,000 | 100 | 120 | 124 |
| Suburban, W'stch'str | 390,000 | 50 | — | 100 |
| *Gas Co.'s of Brooklyn.* | | | | |
| Brooklyn | 2,000,000 | 25 | 170 | 175 |
| Citizens | 1,200,000 | 20 | 75 | 80 |
| " Scrip | 320,000 | 1000 | 95 | 97½ |
| Peoples | 2,000,000 | 10 | — | 40 |
| " Bonds | $ 325,000 | ... | ... | 95 |
| " Scrip | 300,000 | ... | 75 | 80 |
| Metropolitan | 1,000,000 | 100 | 65 | 70 |
| Nassau | 1,000,000 | 25 | — | 78 |
| " Ctfs. | 700,000 | 1000 | 96 | 98 |
| Williamsburgh | 1,000,000 | 50 | 120 | 125 |
| " Scrip | | ... | 100 | 103 |
| Union Co. E N. Y. | | 25 | — | 50 |
| Richmond Co., S. I. | 300,000 | ... | 80 | 90 |
| *Out of Town Gas Companies.* | | | | |
| Bath, Maine | 70,000 | 100 | | |
| Buffalo Mutual, N. Y | 750,000 | 100 | 65 | 70 |
| " Bonds | 200,000 | 1000 | 95 | 100 |
| Baltimore, Md | 2,000,000 | 100 | 134 | 134 |
| " Ctfs., gold | 1,000,000 | | 106 | 110 |
| Bayonne, N. J | | 100 | | 90 |
| Brockport, N. Y | 25,000 | 100 | ... | 80 |
| Citizens, Newark | 918,000 | 50 | 100 | 105 |
| " " Bds. | 124,000 | — | — | -- |
| Cincinnati G & C Co | | | | 190 |
| Derby of Conn | 160,000 | 100 | 60 | 80 |
| East Boston, Mass. | | 25 | 132 | --- |
| Fort Wayne, Ind. | | 100 | ... | --- |
| Hannibal, Mo. | 100,000 | 100 | 95 | 100 |
| Hartford, Conn. | 700,000 | 25 | 184 | 186 |
| Hempstead, L I. | 25,000 | 100 | ... | — |
| Jersey City | 386,000 | 20 | 155 | 160 |
| Jamaica, L. I. | 25,000 | 100 | ... | — |
| Jacksonville, Ill. | 120,000 | 50 | 82 | ... |
| Lewistown Maine | 400,000 | 100 | 50 | 85 |
| Lima, Ohi,o | 60,000 | 100 | — | ... |
| Bonds | 30,000 | | 90 | |
| Laclede, St Louis Mo. | 1,200,000 | 100 | 100 | 110 |
| Long Branch | | 20 | 40 | 50 |
| Peoples, Jersey City | | ... | 120 | 125 |
| Peoples of Albany | 650,000 | 100 | -- | 27 |
| " Bonds | 350,000 | 1000 | -- | - |
| Peoples of Baltimore | | 25 | -- | 56 |
| " Bonds | | | 106 | --- |
| Perth Amboy | | 25 | — | 95 |
| Rochester, N. Y. | | 100 | 50 | 60 |
| Woonsocket, R. I. | 150,000 | 100 | 100 | ... |
| Halifax N. S. | 400,000 | 40 | 148 | 150 |
| Hamilton, Ontario | 150,000 | 40 | 117½ | |
| San Francisco Gas-Co., S. Fr'isco Cal. | | | 111 | 112 |
| St. Louis, Missouri | 600,000 | 50 | 73 | 75 |
| Stillwater, Minn. | 50,000 | 50 | — | 26 |
| Saugerties, N. Y. | 15,000 | 100 | 95 | 100 |
| Troy, Citizens | 600,000 | 100 | — | 60 |
| Toledo, Ohio | | | 95 | 97½ |

## Advertisers Index.


**GAS ENGINEERS.**

| | Page. |
|---|---|
| William Farmer, New York City | 238 |
| James H. Walker and Son, Milwaukee, Wis | 238 |
| E. S. Cathels, Montreal, Canada | 235 |
| George W. Dresser, New York City | 238 |

**GAS WORKS APPARATUS AND CONSTRUCTION.**

| | |
|---|---|
| Herring & Floyd, New York City | 239 |
| T. F. Rowland, Greenpoint, L. I. | 239 |
| J. W. Starr & Son, Camden, N. J. | 239 |
| Delly & Fowler, Philadelphia, Pa. | 235 |
| Kerr Murray, Fort Wayne, Ind. | 239 |
| George Stacey & Co., Cincinnati, Ohio | 239 |
| Brown & Owen, Philadelphia, Pa. | 239 |
| Mackenzie & Sayre Man'f'g Co. | 239 |

**GAS AND WATER PIPES.**

| | |
|---|---|
| McNeals & Archer, Burlington, N. J. | 234 |
| Gloucester Iron Works, Philadelphia, Pa. | 234 |
| Campbell, Brick & Co., New York City | 234 |
| James Marshall & Co., Pittsburgh, Pa. | 234 |
| R. D. Wood & Co., Philadelphia, Pa. | 234 |
| S. Decatur Smith, Philadelphia, Pa. | 234 |
| H. R. Smith & Co., Columbus, Ohio. | 234 |
| William Smith, Pittsburgh, Pa. | 234 |
| B. S. Benson, Baltimore, Md. | 2 |
| Warren Foundry and Machine Co. | 234 |

**PIPE CUTTING MACHINES.**

| | |
|---|---|
| A. C. Wood, Syracuse, N. Y. | 237 |

**RETORTS AND FIRE BRICK.**

| | |
|---|---|
| Geo. C. Hicks & Co. | 242 |
| Evans & Howard, St. Louis, Mo. | 237 |
| J. H. Gautier & Co., Jersey City, N. J. | 236 |
| B. Kreischer & Son, New York City | 237 |
| Adam Weber, New York City. | 236 |
| Gardner Brothers, Pittsburgh Pa. | 236 |
| Laclede Fire Brick Works, St. Louis, Mo. | 276 |
| Brooklyn Retort and Fire Brick Works. | 236 |

**GAS METERS.**

| | |
|---|---|
| Harris, Griffin & Co., Philadelphia, Pa. | 240 |
| American Meter Co., Philadelphia, Pa. | 241 |
| W. W. Goodwin & Co., Philadelphia, Pa. | 241 |
| Harris, Helme & McIlhenny, Philadelphia, Pa. | 241 |

**VALVES.**

| | |
|---|---|
| Chapman Valve Manufacturing Co., Boston, Mass. | 220 |
| Ludlow Valve Manufacturing Co., Troy, N. Y. | 237 |

**EXHAUSTERS.**

| | |
|---|---|
| P. H. & F. M. Roots, Connersville, Ind. | 236 |
| Smith & Sayre Manufacturing Co., New York City. | 240 |

**GAS COALS.**

| | |
|---|---|
| Penn Gas Coal Co., Philadelphia, Pa. | 235 |
| Provincial Gas Coals, Perkins & Job, N. Y. & Boston | 235 |
| Cannelton Coal Co., " " " " | 235 |
| New York & Cleveland Gas Coal Co., Pittsburgh, Pa. | 235 |
| Newburgh Orrel Coal Co., Baltimore, Md. | 235 |
| Despard Coal Co., Baltimore, Md. | 235 |
| Tyrconnell Coal Co., Baltimore, Md. | 23 |
| Fort Pitt Gas Coals. | 23 |

**COKE SHOVELS.**

| | |
|---|---|
| Butler's Patent, New York City. | 235 |

**BURNERS.**

| | |
|---|---|
| C. H. Meyer & Co., Philadelphia, Pa. | 236 |
| C. Gefrorer, Philadelphia, Pa. | 238 |

**PROCESSES.**

| | |
|---|---|
| Gwynne Harris, New York City. | 239 |
| Wren, Brooklyn, N. Y. | 236 |
| Lowe, Philadelphia, Pa. | 237 |

**GAS FIXTURES.**

| | |
|---|---|
| The Perfect Gas Heater. | 240 |
| Mitchell, Vance & Co., New York City. | 238 |

**CEMENT.**

| | |
|---|---|
| S. L. Merchant & Co., New York City. | 241 |

**SCRUBBERS.**

| | |
|---|---|
| St. John & Rockwell, New York City. | 241 |

**CARBON IN RETORTS.**

| | |
|---|---|
| G. W. Edge, Jersey City, N. J. | 211 |

**FOR SALE.**

| | |
|---|---|
| Experimental Holder, New York Gas Co. | 238 |

**BOOKS.**

| | |
|---|---|
| Fodell's Book-Keeping. | 241 |
| Kidd's Guides. | 241 |

**GAS MACHINES.**

| | |
|---|---|
| Walworth Manufacturing Co., Boston, Mass. | 241 |
| Springfield Gas Machine Co., Ne York City. | 241 |

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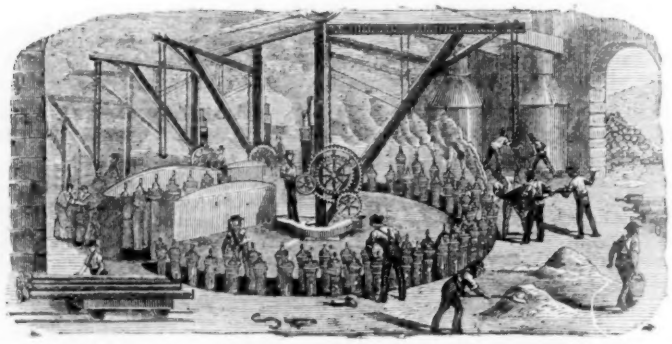

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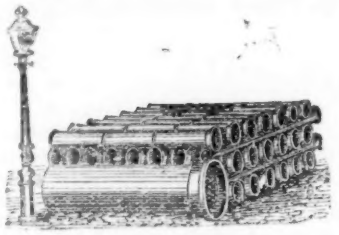

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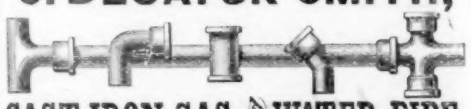

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351-1y

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Best dry coals shipped from Locust Point, wharves, and prompt attention given to orders for chartering of vessels.

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904-

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WATER SUPPLY OF CHICAGO.—City engineer Chesbrough of Chicago, said lately that the water supply of the city averaged now about 50,000,000 gallons per day, or 100 gallons per day for each man, woman and child in the city, estimating the population at 500,000 souls. During the month of August the daily consumption was 60,000,000 gallons of 120 gallons per day for each soul.—*Ibid.*

WATER WORKS FOR THE CITY OF KEOKUK, IND.—The amount of stock necessary to insure the building of water works in the city of Keokuk, Ind., is raised, and work will be commenced at once chiseling, putting in the channel and building the foundation. It is thought the works will be in operation by the middle of May. They are to cost $100,000 and will be of the most approved pattern. Clough & Co., of Chillicothe, Ohio, are the contractors.—*Ibid.*

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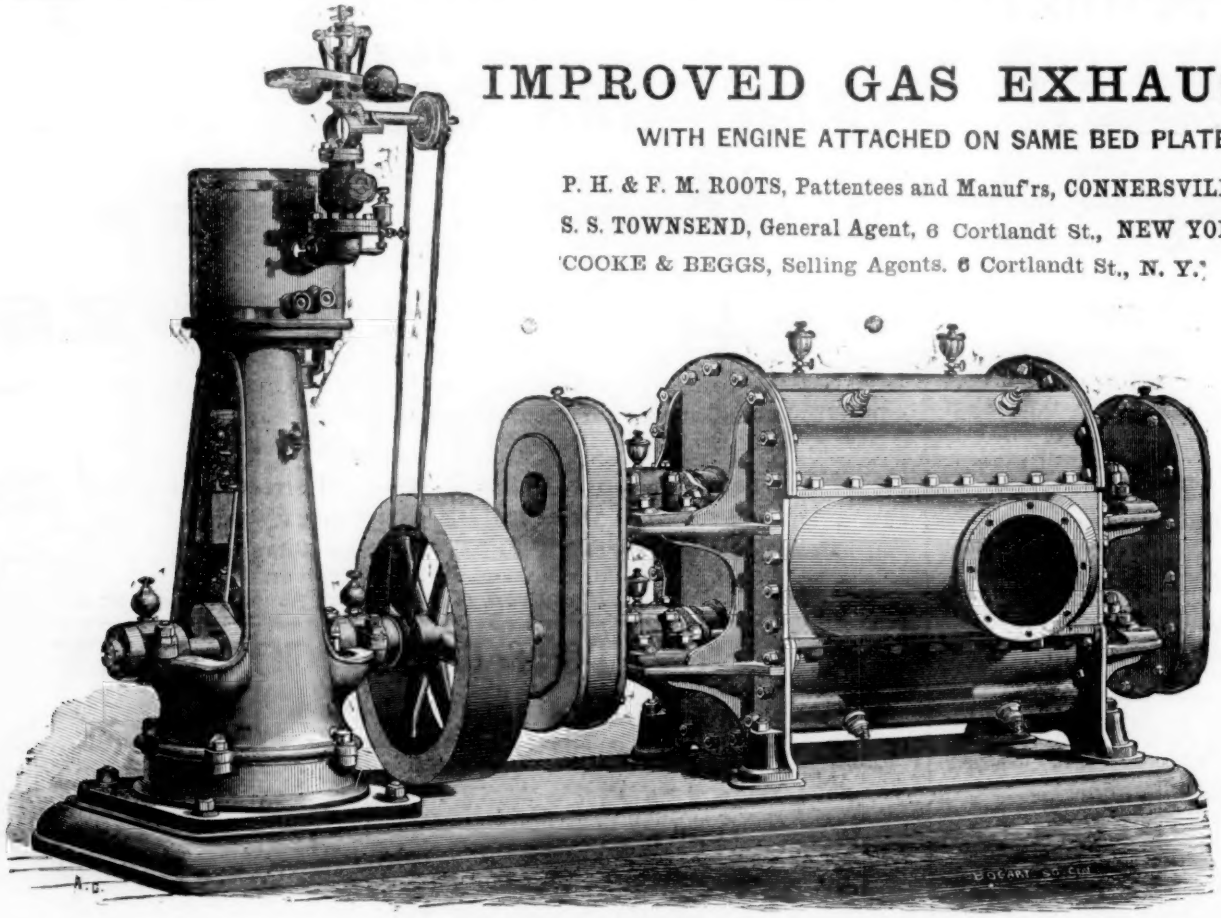

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You can enrich your Coal Gas to any desired standard, by using my process, in the simplest manner, and much cheaper than by *any other* method.

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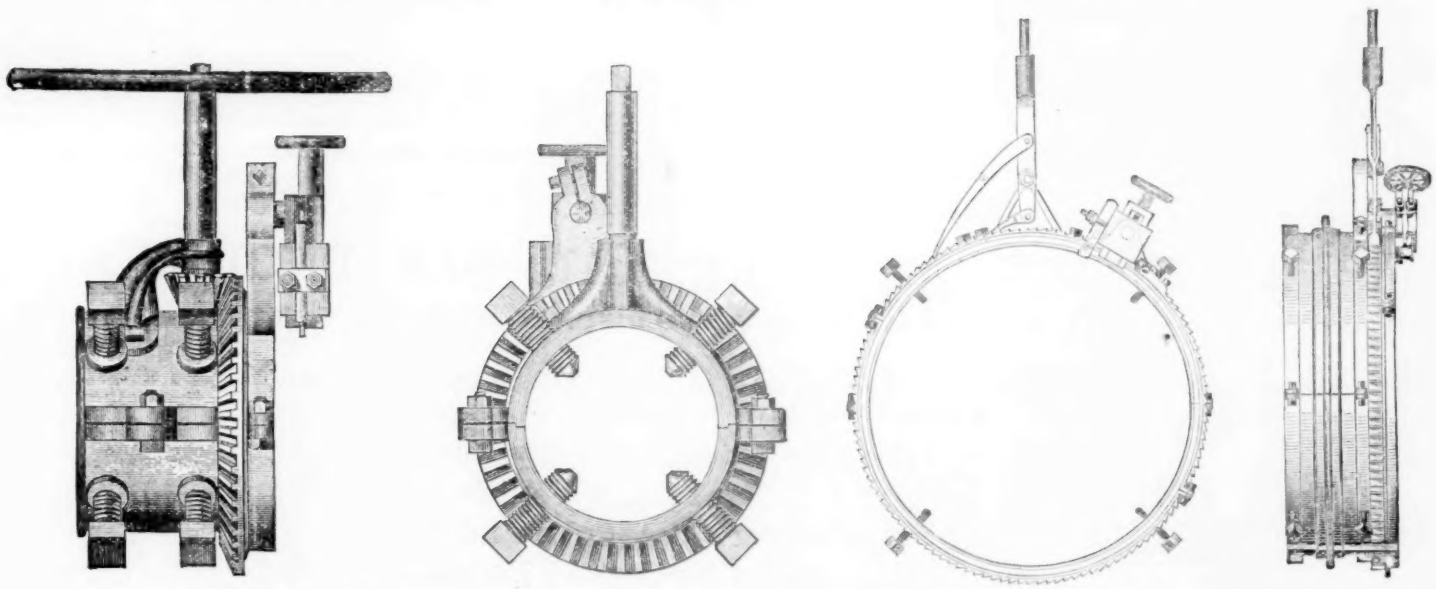

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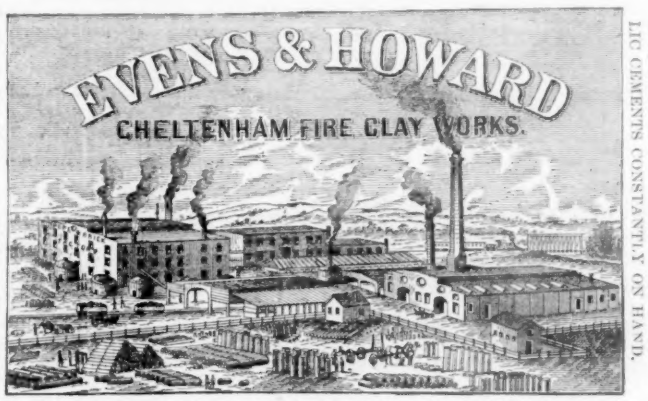


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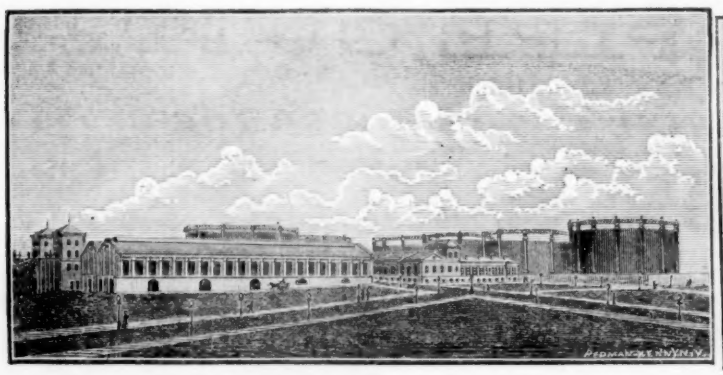

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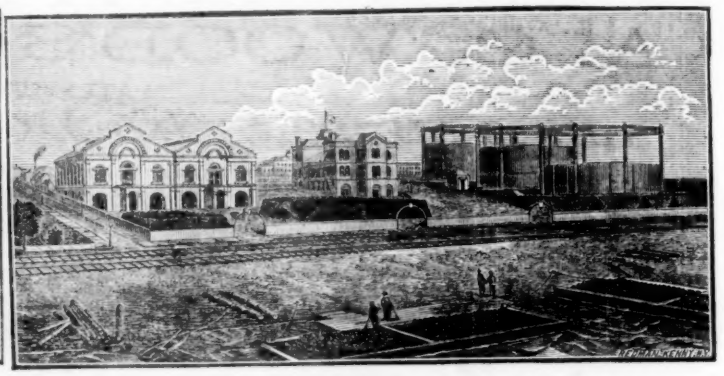

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The process known as GWYNNE-HARRIS, but from later most essential improvements, more appropriately called the ALLEN-HARRIS, or AMERICAN HYDROCARBON process for making "Water Gas," by the decomposition of superheated steam, in fire-clay retorts, set similarly to those in Coal Gas Works, is an established success. More than One Hundred Million cubic feet of gas have been made under this process, and for *permanency* and *brilliancy*, as well as economy both to the manufacturer and consumer, it is superior to any gas made by the old, or any other method.

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Franklin, Ind
Jacksonville, Ill. (2)
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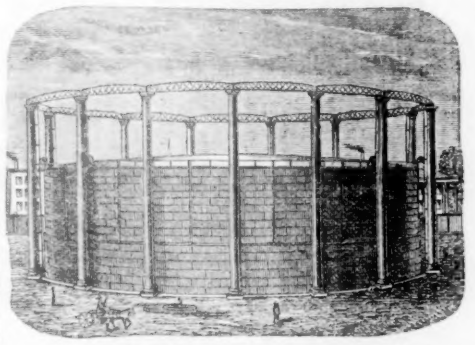

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With cast iron guide and suspension frames. GAS GOVERNORS or REGULATORS, STREET MAINS, from 1½ to 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SLEEVES, etc.

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**P. W. Mackenzie's New Engine and Boiler.**

434—1y

## INTERNATIONAL--1876--EXHIBITION.

The U. S. Centennial Commission

HAVE DECREED AN AWARD TO

**HARRIS, GRIFFIN & CO.,**

**12th and Brown Sts., Philadelphia, and 49 Dey St., N. Y., U. S. A.,**

FOR THE FOLLOWING REASONS:

The Exhibit consists of a Series of METERS from the Largest Size Station Meters for the use of the MANUFACTURE OF GAS, to those for the use of the ORDINARY CONSUMER. The Instruments are WELL MADE, RELIABLE as to INDICATION, and embody a number of sundry improvements which, with the general character of the Exhibit, entitle the whole to commendation,

Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General J. R. HAWLEY, President

GROUP JUDGES.

*AMERICAN.*

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## Mackenzie's Patent Gas Exhausters.

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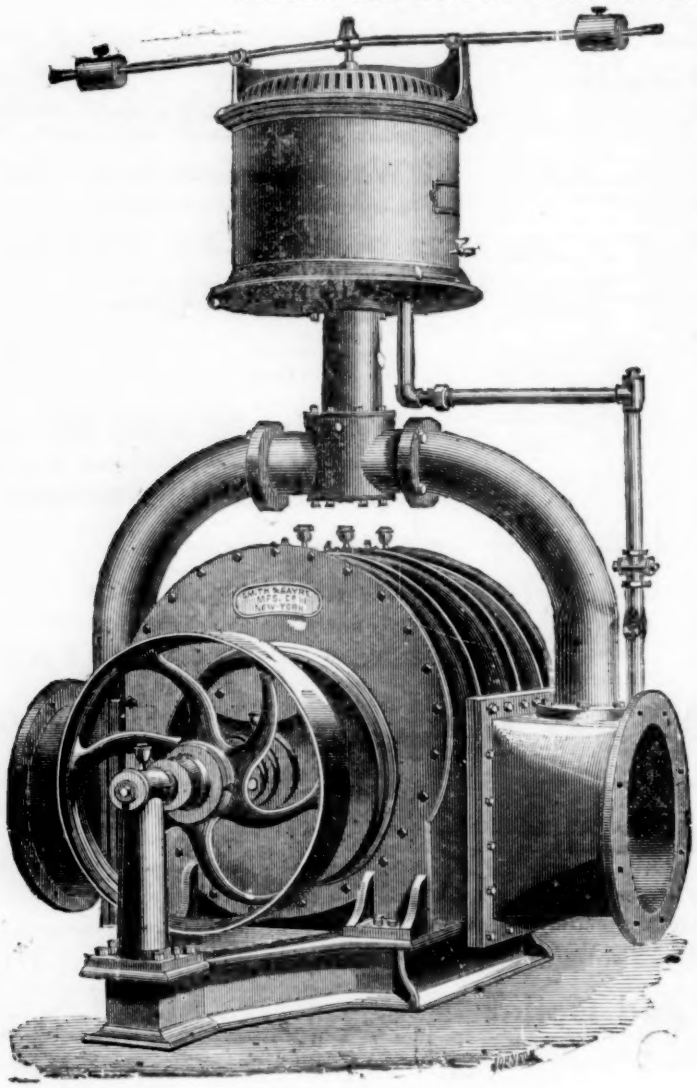

ISBELL'S BALANCE VALVE COMPENSATOR and AUTOMATIC BYE-PASS are used in connection with this Exhauster, as shown in above cut.
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Thorough radiation.

It *can* be connected with a chimney, or run through a small board placed under the window.

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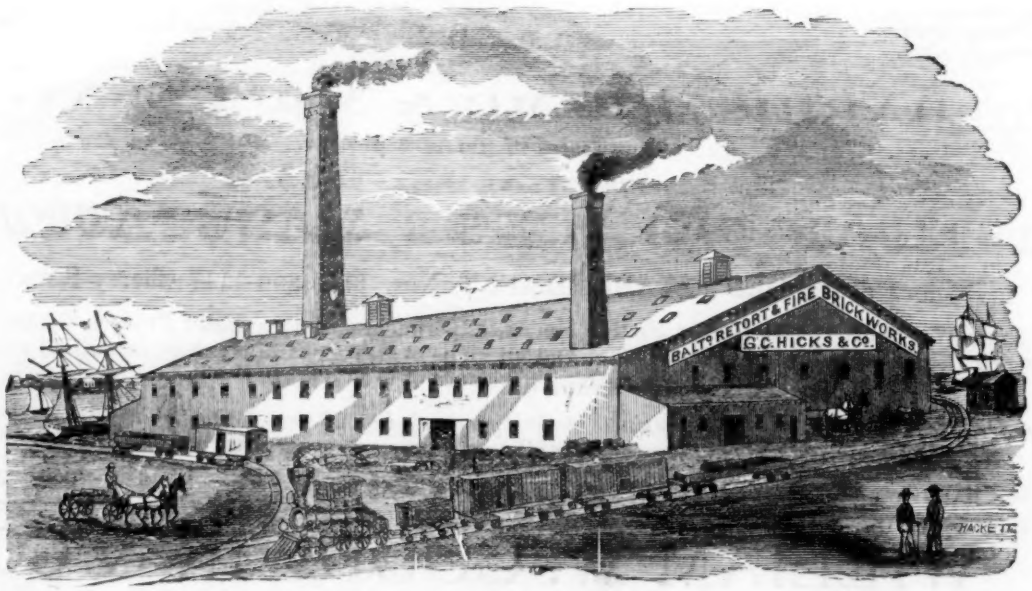


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"GEO. C. HICKS, Esq.,

"Dear Sir,

"Among the letters which you placed in my hands for examination regarding the general standing of your fire clay, gas retorts, and gas furnace, bricks, &c., there were a number from the leading gas manufacturers of the U. S., speaking in the highest possible terms of their durability, freedom from the accumulation of condensed carbon, and general excellence. I regret that these letters are mislaid, or still remain in the Judges' room at the Centennial. I suppose you are aware that your retorts were awarded a First Premium at the Centennial.

"Yours truly, E. T. COX," *of the Centennial Jury of Awards*